NOTICE

Promontory Landfill, LLC is requesting a permit to construct and operate the Promontory Point Class I Landfill located on the west side of the southern tip of the Promontory Point Peninsula in Box Elder County. The waste that the Promontory Point Landfill may accept is restricted to nonhazardous solid waste which is received under contracts with governmental entities that are approved by the Executive Secretary of the Utah Solid and Hazardous Waste Control Board. The permit application has been reviewed by the Utah Division of Solid and Hazardous Waste and a draft permit has been prepared. The *Utah Solid and Hazardous Waste Act* provides for a public comment period to receive comments on the application and the draft permit prior to final action by the Executive Secretary of the Utah Solid and Hazardous Waste Control Board.

The public comment period for the application and draft permit will commence on November 26, 2003 and end on December 30, 2003. A public hearing will be held on December 10, 2003 at 6:30 p.m. in Room 33 of the Historic Box Elder County Courthouse in Brigham City Utah.

The application and draft permit is available for public review on the internet at: http://www.hazardouswaste.utah.gov/hpc-1.htm or as hard copies during normal business hours at the following locations.

Bear River Health Department
817 West 950 South
Brigham City, Utah

Division of Solid and Hazardous Waste
Utah Department of Environmental Quality
288 North 1460 West, 4th Floor
Salt Lake City, Utah

Written comments will be accepted until 5:00 p.m. December 30, 2003 and should be mailed or delivered to:

Dennis R. Downs, Executive Secretary
Utah Solid and Hazardous Waste Control Board
Utah Department of Environmental Quality
288 North 1460 West
PO Box 144880
Salt Lake City, Utah 84114 - 4880

Comments may also be sent by electronic mail to: swpublic@utah.gov. Comments sent in electronic format must also be received by 5:00 p.m. December 30, 2003 and should be identified by putting the following in the subject line: "Comments on Promontory Point Class I Landfill."

For further information, contact Carl Wadsworth or Ralph Bohn, Division of Solid and Hazardous Waste, 801-538-6170. In compliance with the Americans with Disabilities Act, individuals with special needs (including auxiliary communicative aids and services) should contact Charlene Lamb, Office of Human Resources, at 801-536-4413 (TDD 536-4414) at least five working days prior to a scheduled meeting or hearing.

UTAH SOLID AND HAZARDOUS WASTE CONTROL BOARD
Draft SOLID WASTE PERMIT

CLASS I LANDFILL

Pursuant to the provisions of the *Utah Solid and Hazardous Waste Act*, Title 19, Chapter 6, Utah Code Annotated (UCA) 1953, as amended (the Act) and the *Utah Solid Waste Permitting and Management Rules*, Utah Administrative Code (UAC) R315-301 through 320 adopted thereunder,

Promontory Landfill, LLC

is hereby authorized to construct and operate the **Promontory Point Class I Landfill** located in Sections 13, 14, 19, 23, 24, 25, and 30, Township 6 North, Ranges 5 and 6 West, Salt Lake Base and Meridian, Box Elder County, Utah as described and shown in the permit application that was determined complete on October 24, 2003.

The operation of the landfill is subject to the condition that **Promontory Landfill, LLC** (Permittee) meet the requirements set forth herein.

All references to UAC R315-301 through 320 are to regulations that are in effect on the date that this permit becomes effective.

This permit shall become effective ___________________________.

This permit shall expire at midnight __________________________.

Signed this __________ day of ___________________, 2004.

Dennis R. Downs, Executive Secretary
Utah Solid and Hazardous Waste Control Board

PERMIT REQUIREMENTS

LANDFILL NAME: Promontory Point Class I Landfill

OWNER NAME: Promontory Landfill, LLC

OWNER ADDRESS: 1515 West 2200 South, Suite C
Salt Lake City, Utah 84119

OWNER PHONE NO. 801-972-2727 or 801-243-3200

TYPE OF PERMIT: Class I Landfill

PERMIT NUMBER: 0202

LOCATION: Landfill site is located on the west side of the southern tip of the Promontory Point Peninsula in Sections 13, 14, 19, 23, 24, 25, and 30, Township 6 North, Ranges 5 and 6 West, Salt Lake Base and Meridian, Box Elder County, Utah as described and shown in the permit application that was determined complete on October 24, 2003. Lat. 41E 12N 55O, Long. 112E 28N 05O

Permit as used in this document is defined in Utah Administrative Code (UAC) R315-301-2(55).

The application, as deemed complete on October 24, 2003 is hereby approved and is incorporated by reference into this Solid Waste Permit. All representations made in the permit application are part of this permit and are enforceable under UAC 315-301-5(2). The permit application will become part of the operating record of the Landfill. Where differences in wording exist between this permit and the application, the wording of the permit supersedes that of the application.

By this permit to own and operate, the Permittee is subject to the following conditions.

I. GENERAL COMPLIANCE RESPONSIBILITIES

A. General Operation

The Permittee shall operate the landfill in accordance with all applicable requirements of UAC R315-302 and 303, for a Class I landfill, that are currently effective unless otherwise noted in this permit. Any permit noncompliance or other noncompliance constitutes a violation of UAC R315-302 or 303 and is grounds for appropriate enforcement action, permit revocation, modification, or denial of a permit renewal application.

B. Acceptable Waste

This permit is restricted to the disposal of nonhazardous solid waste which is received under contracts approved by the Executive Secretary. These wastes include municipal solid waste, as defined by UAC R315-301-2(47); industrial waste, as defined by UAC R315-301(35) and special waste as defined by UAC R315-301-2(71), generated within the boundaries of the governmental entity under contract.

C. Prohibited Waste

No hazardous waste as defined by UAC R315-1 and R315-2, except waste specified by UAC R315-303-4(7)(a)(i)(B); or PCB's as defined by UAC R315-301-2(53), except those specified by UAC R315-315-7(2), may be accepted for treatment, storage, or disposal at the landfill. All wastes not received under contracts approved by the Executive Secretary are prohibited. Any prohibited waste received and accepted for treatment, storage, or disposal at the facility will constitute a violation of this permit and UAC R315-303-4(7).

D. Inspections and Inspection Access

The Permittee shall allow the Executive Secretary of the Utah Solid and Hazardous Waste Control Board or an authorized representative of the Board, including representatives from the Bear River Health Department, to enter at reasonable times and:

1. Inspect the landfill or other premises, practices or operations regulated or required under the terms and conditions of this Permit or UAC R315-301 through 320;

2. Have access to and copy any records required to be kept under the terms and conditions of the Permit or UAC R315-301 through 320;

3. Inspect any loads of waste, treatment facilities or processes, pollution management facilities or processes, or control facilities or processes required under the Permit or regulated under UAC R315-301 through 320; and

4. Create a record of any inspection by photographic, videotape, electronic, or any other reasonable means.

E. Noncompliance

1. If monitoring, inspection, or testing indicates that any permit condition or any applicable rule under UAC R315-301 through 320 may be or is being violated, the Permittee shall promptly make corrections to the operation or other activities to bring the facility into compliance with all permit conditions or rules. In the event of any noncompliance with any permit condition or violation of an applicable rule, the Permittee shall promptly take any feasible action reasonably necessary to correct the noncompliance or violation and mitigate any risk to the human health or the environment. Actions may include eliminating the activity causing the noncompliance or violation and containment of any waste or contamination using barriers or access restrictions, placing of warning signs, or permanently closing areas of the facility. The Permittee shall: document the noncompliance or violation in the operating record, on the day the event occurred or the day it was discovered; notify the Executive Secretary of the Solid and Hazardous Waste Control Board within 24 hours, or the next business day following documentation of the event; and give written notice of the noncompliance or violation and measures taken to protect public health and the environment within seven days of Executive Secretary notification. Within thirty days of the documentation of the event, the Permittee shall submit, to the Executive Secretary, a written report describing the nature and extent of the noncompliance or violation and the remedial measures taken or to be taken to protect human health and the environment and to eliminate the noncompliance or violation. Upon receipt and review of the assessment report, the Executive Secretary may order the Permittee to perform appropriate remedial measures including development of a site remediation plan for approval by the Executive Secretary.

2. In an enforcement action, the Permittee may not claim as a defense that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with UAC R315-301 through 320 and this permit.

3. Compliance with the terms of this permit does not constitute a defense to actions brought under any other local, State, or Federal laws. This permit does not exempt the Permittee from obtaining any other local, State or Federal permits or approvals.

4. The issuance of this Permit does not convey any property rights, other than the rights inherent in this permit, in either real or personal property, or any exclusive privileges nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations including zoning ordinances.

5. The provisions of this Permit are severable. If any provision of this Permit shall be held invalid for any reason, the remaining provisions shall remain in full force and effect. If the application of any provision of this Permit to any circumstance is held invalid, its application to other circumstances shall not be affected.

F. Revocation

1. This permit may be subject to revocation if any condition of the permit is not being met. The Permittee will be notified in writing prior to any proposed revocation action and such action will be subject to all applicable hearing procedures established under UAC R315-12 and the *Utah Administrative Procedures Act*.

2. Revocation of this permit does not revoke the financial assurance established for closure and post-closure care of the facility, nor remove any responsibility for completion of closure and post-closure care for the facility required in UAC R315-302-3.

G. Attachment Incorporation

Attachments incorporated by reference are enforceable conditions of this permit, as are documents incorporated by reference into the attachments. Language in this permit supercedes any conflicting language in the attachments or documents incorporated into the attachments.

II. DESIGN AND CONSTRUCTION

A. Design and Construction

1. Prior to Construction. The Permittee shall submit construction design drawings and a Construction Quality Control and Construction Quality Assurance (CQC/CQA) Plan to the Executive Secretary for approval prior to each landfill unit or cell, liner, run-on and runoff diversion system, waste treatment facility, or final cover construction event. Buildings do not require approval. The

Permittee shall construct the landfill units or cells, cell liners, run-on and run-off diversion systems, waste treatment facilities, and the final cover in accordance with the design drawings and CQC/CQA Plans submitted and approved by the Executive Secretary.

2. Subsequent to Construction. The Permittee shall notify the Executive Secretary upon completion of construction of any landfill unit or cell, liner, run-on or run-off diversion system, waste treatment facility, or final cover. Landfill units or cells may not be used for treatment or disposal of waste until all CQC/CQA documents and construction related documents including as-built drawings are approved by the Executive Secretary. The Permittee shall submit as-built drawings for each construction event that are signed and sealed by an engineer registered in the State of Utah.

3. Partial Final Cover. The Permittee shall notify the Executive Secretary of any proposed incremental closure or placement of any part of the final cover. Construction of any portion of the final cover shall be considered as a separate construction event and shall be approved separately from any other construction or expansion of the landfill. Design approval must be received from the Executive Secretary prior to construction and must be accompanied by a CQC/CQA Plan, for each construction season where incremental closure is performed.

4. All engineering drawings submitted to the Executive Secretary must be stamped and approved by a professional engineer with a current registration in Utah.

B. Run-On Control

Drainage channels and diversions shall be constructed as specified in the permit application and maintained at all times to effectively prevent runoff from the surrounding area from entering the landfill.

C. Quality Assurance Construction Plan

1. A quality assurance plan for construction of the liner system, leachate collection system, and final landfill cover shall be submitted by the Permittee along with all necessary documentation to the Executive Secretary. Executive Secretary approval must be received prior to construction of any part of the liner system or final cover at the landfill.

2. A qualified independent third party shall perform the quality assurance function of the approved construction quality control/quality assurance (QC/QA) plan. The results must be submitted as part of the as-built drawings to the Executive Secretary.

III. LANDFILL OPERATION

A. Operations Plan

The Operations Plan included in the permit application and the solid waste permit issued by the Executive Secretary shall be kept on-site at the landfill. The landfill shall be operated in accordance with the operations plan as included in the permit application. If necessary, the facility owner may modify the Operations Plan, provided that the modification meets all of the requirements of UAC R315-301 through 320 and is as protective of human health and the environment as that approved in the permit application. Any modification to the Operations Plan shall be approved by the Executive Secretary and noted in the operating record.

B. Security

The Permittee shall operate the Landfill so that unauthorized entry to the facility is prevented. All facility gates and other access routes shall be locked during the time the landfill is not open. At least two persons, employed by Promontory Landfill, LLC, shall be at the landfill during all hours that the landfill is open. Fencing and any other access controls as shown or described in the permit application shall be constructed to prevent access of persons or livestock by other routes.

C. Training

The Permittee shall provide training for on-site personnel in landfill operation, including waste load inspection, hazardous waste identification, and personal safety and protection.

D. Burning of Waste

Intentional burning of solid waste is prohibited and is a violation of UAC R315-303-4(2)(b).

E. Daily Cover

The solid waste received at the landfill shall be completely covered at the end of each working day with a minimum of six inches of earthen material. Any alternative daily cover must be approved by the Executive Secretary prior to its use.

F. Ground Water Monitoring

The Permittee shall monitor the ground water underlying the landfill in accordance with the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan contained in the permit application. If necessary, the facility owner may modify the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan, provided that the modification meets all of the requirements of UAC R315-301 through 320 and is as protective of human health and the environment as that approved in the permit application. Any modification to the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan must be approved by the Executive Secretary and shall be noted in the operating record.

G. Gas Monitoring

The Permittee shall monitor explosive gases at the landfill in accordance with the Gas Monitoring Plan contained in the permit application and shall otherwise meet the requirements of UAC R315-303-3(5). If necessary, the facility owner may modify the Gas Monitoring Plan, provided that the modification meets all of the requirements of UAC R315-301 through 320 and is as protective of human health and the environment as that approved in the permit renewal application. Any modification to the Gas Monitoring Plan must be approved by the Executive Secretary and shall be noted in the operating record.

If the concentrations of explosive gases at any of the facility structures, at the property boundary or beyond, ever exceed the standards set in UAC R315-303-2(2)(a), the Permittee shall immediately take all necessary steps to ensure protection of human health and notify the Executive Secretary. Within seven days of detection, place in the operating record the explosive gas levels detected and a description of the immediate steps taken to protect human health. Implementation of a remediation plan shall meet the requirements as stated in UAC R315-303-3(5)(b) and shall be submitted to and receive approval from the Executive Secretary prior to implementation.

H. Waste Inspections

The Permittee shall visually inspect incoming waste loads to verify that no wastes other than those allowed by this permit are disposed in the landfill. A complete waste inspection shall be conducted at a minimum frequency of 1 % of incoming loads from a transfer station that has no approved load inspection program, but no less than one complete inspection per day. Loads received from a transfer station that follows an inspection program approved by the Executive Secretary do not need to be inspected.

Loads to be inspected shall be chosen on a random basis. The operating record must contain documentation that each load is received under a contract approved by the Executive Secretary.

All containers capable of holding more than five gallons of liquid will be inspected to determine if the waste is acceptable for disposal.

All loads that the operator suspects may contain a waste not allowed for disposal at the landfill will be inspected.

Complete random inspections shall be conducted as follows:

1. The operator shall conduct the random waste inspection at the working face or an area designated by the operator.

2. The load to be inspected will be chosen on a random basis;

3. Loads subjected to complete inspection shall be unloaded at the designated area;

4. Loads shall be spread by equipment or by hand tools;

5. A visual inspection of the waste shall be conducted by personnel trained in hazardous waste recognition and recognition of other unacceptable waste; and

6. The inspection shall be recorded on the waste inspection form found in Appendix O of the permit application. The form shall be placed in the operating record at the end of the operating day.

I. Disposal of Liquids

Disposal of containers of liquids larger than household size (five gallons), noncontainerized material containing free liquids, sludge containing free liquids, or any waste containing free liquids in containers larger than five gallons is prohibited.

J. Disposal of Special Wastes

Animal carcasses may be disposed at the bottom of the landfill working face and must be covered with other solid waste or earth by the end of the operating day they are received or they may be disposed in a special trench or pit prepared for the acceptance of dead animals. If a special trench is used, animals placed in the trench shall be covered with six inches of earth by the end of each operating day.

Asbestos waste shall be handled and disposed in accordance with UAC-315-315-2.

If loads of incinerator ash are accepted for disposal it shall be transported in such a manner to prevent leakage or the release of fugitive dust. The ash shall be completely covered with a minimum of six inches of material, or use other methods or material, if necessary, to control fugitive dust. Ash may be used for daily cover when its use does not create human health and environmental hazard.

K. Self Inspections

The Permittee shall inspect the facility to prevent malfunctions and deterioration, operator errors, and discharges that may cause or lead to the release of wastes or contaminated materials to the environment or create a threat to human health. These general inspections shall be completed no less than quarterly and shall cover the following areas: Waste placement, compaction, and cover; unit liner; leachate collection system; fences and access controls; roads; run-on/run-off controls; ground water monitoring wells; final and intermediate cover; litter controls; and records. A record of the inspections shall be placed in the daily operating record on the day of the inspection. Areas needing correction, as noted on the inspection report, shall be corrected. The corrective actions shall be documented in the daily operating record.

L. Recordkeeping

The Permittee shall maintain and keep on file at the landfill site, a daily operating record and other general records of landfill operation as required by UAC R315-302-2(3).

1. The daily operating record shall include the following items:

   a. The number of loads of waste and the weights or estimates of weights or volume of waste received each day of operation and recorded at the end of each operating day;

b. Major deviations from the approved plan of operation recorded at the end of the operating day the deviation occurred;

c. Results of other monitoring required by this permit recorded in the operating record on the day of the event or the day the information is received;

d. Records of all inspections conducted by the Permittee, results of the inspections, and corrective actions taken shall be recorded in the record on the day of the event;

2. The general record of landfill operations shall include the following items:

a. A copy of the permit including the permit application;

b. Results of inspections conducted by representatives of the Utah Solid and Hazardous Waste Control Board and/or representatives of the Bear River Health Department, when forwarded to the Permittee;

c. Closure and Post-closure care plans;

d. Records of employee training;

e. Results of groundwater monitoring; and

f. Results of landfill gas monitoring.

M. Reporting

The Permittee shall prepare and submit, to the Executive Secretary, an Annual Report as required in UAC R315-302-2(4). The Annual Report shall include: the period covered by the report, the annual quantity of waste received, an annual update of the financial assurance mechanism, a re-application for approval of the financial assurance mechanism, any leachate analysis results, all ground water monitoring results, the statistical analysis of ground water monitoring results, the results of gas monitoring, the quantity of leachate pumped, and all training programs completed.

N. Roads

All access roads, within the landfill boundary, used for transporting waste to the landfill for disposal shall be improved and maintained as necessary to assure safe and reliable all-weather access to the disposal area.

O. Litter Control

The Permittee shall control wind blown litter at the landfill in accordance with the Fugitive Waste Plan contained in Appendix L of the permit application and otherwise prevent litter from escaping the landfill boundary.

P. Dust Control

The Permittee shall control dust generated from landfill operation as necessary.

IV. CLOSURE REQUIREMENTS

A. Closure

Final cover of the landfill shall be as shown in the permit application. The final cover shall meet at a minimum the standard design for closure as specified in the UAC (R315-303-3(4)) plus sufficient cover soil or equivalent material to protect the low permeability layer from the effects of frost, desiccation, and root penetration. A quality assurance plan for construction of the final landfill cover shall be submitted to, and approval of the plan must be received from the Executive Secretary prior to construction of any part of the final cover at the landfill. A qualified third party shall perform permeability testing on the recompacted clay placed as part of the final cover.

B. Title Recording

The Permittee shall also meet the requirements of UAC R315-302-2(6) by recording with the Box Elder County Recorder as part of the record of title that the property has been used as a landfill.

C. Post-Closure Care

Post-closure care at the closed landfill shall be done in accordance with the Post-Closure Care Plan contained in the permit application. Post-closure care shall continue until all waste disposal sites at the landfill have stabilized and the finding of UAC R315-302-3(7)(c) is made.

D. <u>Financial Assurance</u>

1. A financial assurance mechanism covering closure and post-closure care costs that meets the requirements of UAC R315-309 shall be proposed by the Permittee and approved by the Executive Secretary. The approved mechanism shall be established by the Permittee prior to receipt of waste. The financial assurance mechanism shall provide for the cost of closure at any stage or phase or anytime during the life of the landfill and for the subsequent post-closure care costs.

2. The Permittee shall notify the Executive Secretary of the establishment of the approved financial assurance mechanism and must receive acknowledgment from the Executive Secretary that the established mechanism complies with the requirements of UAC R315-309 prior to the acceptance of waste.

E. <u>Financial Assurance Annual Update</u>

An annual revision of closure and post-closure care cost estimates and the financial assurance mechanism shall be submitted to the Executive Secretary as part of the annual report required by Section III-M of this permit.

V. ADMINISTRATIVE REQUIREMENTS

A. <u>Permit Modification</u>

Modifications to this permit may be made upon application by the Permittee or by the Executive Secretary. The Permittee will be given written notice of any permit modification initiated by the Executive Secretary.

B. <u>Permit Transfer</u>

This permit may be transferred to a new Permittee by meeting the requirements of the permit transfer provisions of UAC R315-310-10.

C. <u>Expansion</u>

1. This permit is for the operation of a Class I Landfill according to the design and Operation Plan described and explained in the permit application. Any expansion of the current footprint designated in the description contained in the

permit application, but within the property boundaries designated in the permit application, will require submittal of plans and specifications to the Executive Secretary. The plans and specifications must be approved by the Executive Secretary prior to construction.

2. Any expansion of the landfill facility beyond the property boundaries designated in the description contained in the permit application will require submittal of a new permit application in accordance with the requirements of UAC R315-310.

3. Any expansion of the waste accepted at the landfill facility will require submittal of all necessary information to the Executive Secretary and the approval of the Executive Secretary.

D. Expiration

This permit shall expire five years from the effective date which is the date shown on the signature (first) page of this permit. Application for permit renewal shall be made at least 180 days prior to the expiration of this permit. If a timely renewal application is made and the permit renewal is not complete by the expiration date, this permit will continue in force until renewal is completed or denied.

E. Status Notification

Eighteen months from the date of this permit the Executive Secretary shall be notified in writing of the status of the construction of this facility unless construction is complete and operation has commenced. If construction has not begun within 18 months the Permittee will submit adequate justification to the Executive Secretary as to the reasons that construction has not commenced. If no submission is made or the submission is judged inadequate by the Executive Secretary, this permit may be revoked.

F. Construction Approval and Request to Operate

The Permittee shall notify the Executive Secretary, prior to acceptance of waste, that all the requirements of this permit have been met and all required facilities, structures and accounts are in place as required. The facility may not accept waste until approval of the Executive Secretary is received.

G. Contract Approval

The Permittee must receive waste only from governmental entities that have contracts with the facility owner. All new contracts and changes in existing contracts must be reviewed and receive approval from the Executive Secretary prior to receipt of waste.

File: Promontory Point Class I Landfill

PROMONTORY LANDFILL LLC

CLASS I LANDFILL

PERMIT APPLICATION

Prepared for:

PACIFIC WEST, L.L.C.

1515 West 2200 South, Suite C

Salt Lake City, Utah 84119

Prepared by:

AQUA ENGINEERING, INC.

533 West 2600 South – Suite 275

Bountiful, Utah 84010

August 2003

ENGINEER'S CERTIFICATION AND DECLARATION

I, Craig G. Neeley, hereby certify that I am a Registered Professional Civil Engineer holding registration number 169985 in the state of Utah. I declare that this Promontory Landfill LLC Class I Landfill Permit Application was prepared under my direct supervision for Pacific West, L.L.C., Salt Lake City, Utah.

REGISTERED PROFESSIONAL ENGINEER
No. 169985
CRAIG G. NEELEY
8-6-2003
STATE OF UTAH

Exp. 12-31-2004

Craig G. Neeley, P. E.

Utah Reg. 169985

Utah Class I and V Landfill Permit Application Form

Part I General Information APPLICANT: PLEASE COMPLETE ALL SECTIONS.

I. Landfill Type	☒ Class I ☐ Class V	**II. Application Type**	☒ New Application ☐ Renewal Application	☐ Facility Expansion ☐ Modification	

For Renewal Applications, Facility Expansion Applications and Modifications Enter Current Permit Number ______

III. Facility Name and Location

Legal Name of Facility: Promontory Landfill, LLC				
Site Address (street or directions to site): Southwest tip of promontory peninsula			County: Box Elder	
City: N/A	State: UT	Zip Code:	Telephone: (801)972-2727	
Township	Range	Section(s)	Quarter/Quarter Section	Quarter Section
Main Gate Latitude 41 degrees 12 minutes 55 seconds			Longitude 112 degrees 28 minutes 05 seconds	

IV. Facility Owner(s) Information

Legal Name of Facility Owner: Promontory Landfill LLC			
Address (mailing): 1515 West 2200 S #c			
City: Salt Lake City	State: UT	Zip Code: 84119	Telephone: (801)972-2727

V. Facility Operator(s) Information

Legal Name of Facility Operator: Pacific West LLC			
Address (mailing): 1515 West 2200 South ste c			
City: Salt Lake City	State: UT	Zip Code: 84119	Telephone: (801)972-2727

VI. Property Owner(s) Information

Legal Name of Property Owner: Promontory Landfill LLC			
Address (mailing): 1515 West 2200 South Ste C			
City: Salt Lake City	State: UT	Zip Code: 84119	Telephone: (801)972-2727

VII. Contact Information

Owner Contact: Mark Easton		Title: Solid Waste Director	
Address (mailing): 1515 West 2200 South ste C			
City: Salt Lake City	State: UT	Zip Code: 84119	Telephone: (801)972-2727
Email Address: measton@pacwestllc.com		Alternative Telephone (cell or other)	(801)243-3200
Operator Contact: Mark Easton		Title: Solid Waste Director	
Address (mailing): 1515 West 2200 South Ste C			
City: Salt Lake City	State: UT	Zip Code: 84119	Telephone: (801)972-2727
Email Address: measton@pacwestllc.com		Alternative Telephone (cell or other)	(801)243-3200
Property Owner Contact: Mark Easton		Title: Promontory Landfill director	
Address (mailing): 1515 West 2200 South Ste C			
City: Salt Lake City	State: UT	Zip Code: 84119	Telephone: (801)972-2727
Email Address: measton@pqcwestllc.com		Alternative Telephone (cell or other)	(801)243-3200

Utah Class I and V Landfill Permit Application Form

Part I General Information (Continued)

VIII. Waste Types (check all that apply)

Waste Type	Combined Disposal Unit	Monofill Unit
☒ Municipal Waste	☐	☐
☐ Construction & Demolition	☐	☐
☐ Industrial	☐	☐
☐ Incinerator Ash	☐	☐
☐ Animals	☐	☐
☐ Asbestos	☐	☐
☐ PCB's (R315-315-7(3) only)	☐	☐
☐ Other ______	☐	☐

IX. Facility Area

Facility Area	2,000	acres
Disposal Area	1,000	acres
Design Capacity		
Years	121 years	
Cubic Yards	642,000,000	
Tons	385,200,000	

X. Fee and Application Documents

Indicate Documents Attached To This Application

☐ Application Fee: Amount $

☒ Facility Map or Maps ☒ Facility Legal Description ☒ Plan of Operation ☒ Waste Description

☒ Ground Water Report ☒ Closure Design ☒ Cost Estimates ☒ Financial Assurance

Class V Special Requirements

☐ Documents required by UCA 19-6-108(9) and (10)

I HEREBY CERTIFY THAT THIS INFORMATION AND ALL ATTACHED PAGES ARE CORRECT AND COMPLETE.

Signature of Authorized Owner Representative	Title	Date
Mark A Easton	Solid Waste Director	8/4/03
Name typed or printed: Mark H Easton	Address: 1515 West 2200 South #c SlC, UT8411	

Signature of Authorized Land Owner Representative (if applicable)	Title	Date
Mark A Easton	Solid Waste Director	8/4/03
Name typed or printed: Mark H Easton	Address: 1515 West 2200 South Ste C, SLC UT	

Signature of Authorized Operator Representative (if applicable)	Title	Date
Mark A Easton	Solid Waste Director	8/4/03
Name typed or printed: Mark H Easton	Address: 1515 West 2200 South Ste C SLC UT	

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CHAPTER VI – CLOSURE AND POST-CLOSURE PLANS

LIST OF APPENDICES

CHAPTER I
INTRODUCTION

1.1 INTRODUCTION

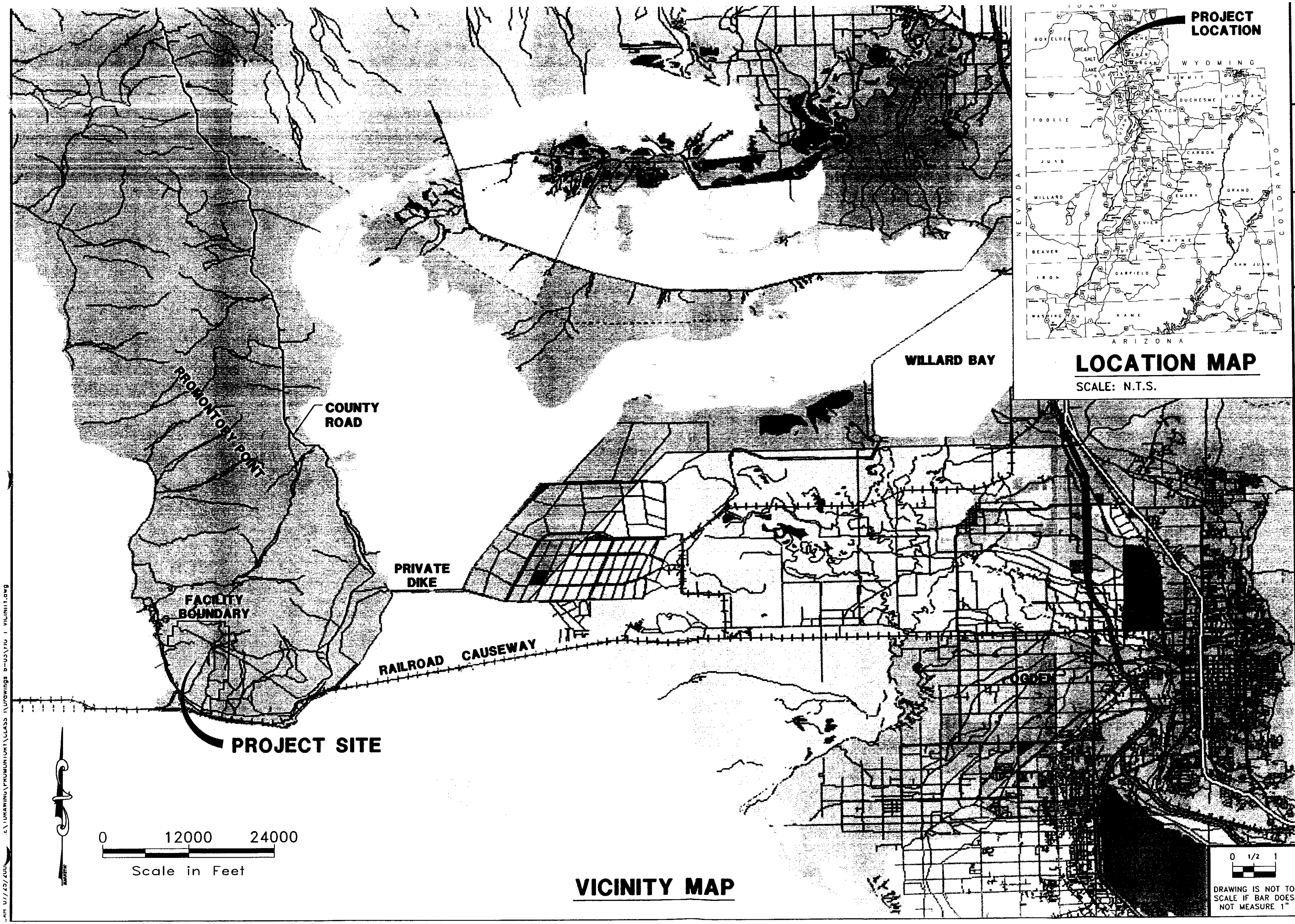
Promontory Landfill, LLC (hereafter called OWNER) and municipalities and counties of the State of Utah are investigating the feasibility of creating a Class I Landfill on the southwest portion of Promontory Point Peninsula, Box Elder County, Utah. This report has been prepared to satisfy the requirements of the State of Utah Solid Waste Permitting and Management Rules.

The site is located on the west side of the southern tip of the Promontory Point Peninsula and is protected visually from the Wasatch Front by several small islands and mountains. Access to the proposed landfill facility would be either by way of the Union Pacific Railroad causeway, a private dike, or a county road as shown on Figure 1.1. The site surficial soils consist of sand, clay, silt, gravel, and rock. The site slopes moderately draining southwest into the Great Salt Lake and is covered with vegetation including cheat grass, galleta grass, crested wheatgrass, greasewood, halogeton, and rabbit brush.

Construction of the Class I Landfill would begin soon after approval of the Permit Application and permit issuance by the State of Utah, Department of Environmental Quality (DEQ). The proposed Class I Landfill would be designed, operated, and constructed in accordance with all Federal and State Laws and regulations applicable to its management and operation.

1.2 EXISTING UTILITIES

The remote nature of the Promontory Peninsula has meant few if any utilities have been developed. Power is available to serve mechanized operations and wells. Site water would be provided by local sources. See Figure 1.2 for a map of existing utilities on and near by the



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DATE: JULY 2003

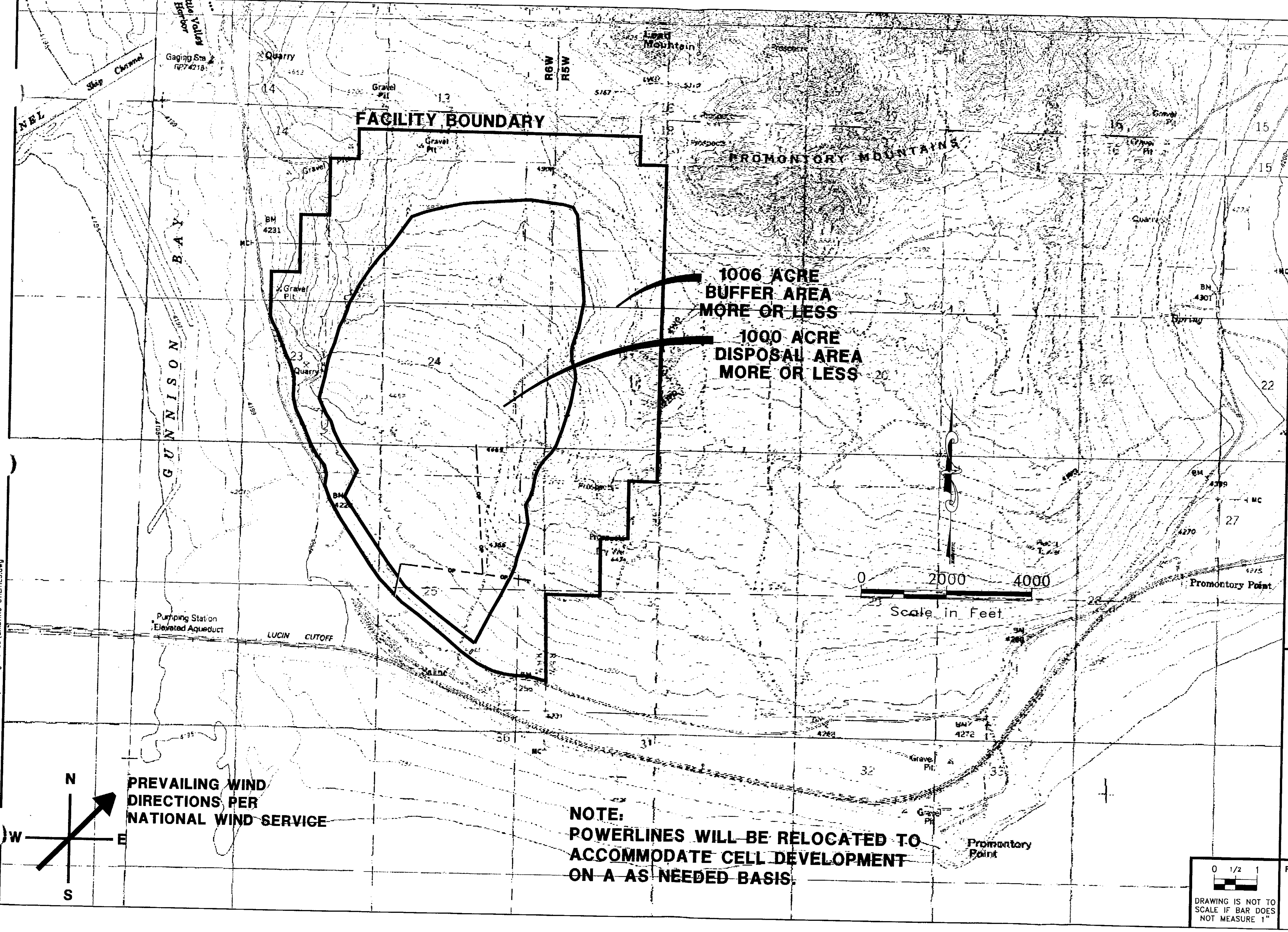
ENGINEERS SEAL

REVISIONS	
NO.	DATE

PROMONTORY LANDFILL LLC
PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
VICINITY MAP

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE: 1.1



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DATE: JULY 2003

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NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
EXISTING UTILITIES

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

FIGURE:
1.2

landfill site. No gas lines traverse the Promontory Peninsula. Telephone service is currently not available through landlines. The nearest landline, which could feasibly be brought to the site is located to the north and east but is cost prohibitive. All communication on and off the landfill site would be by cell phone or radio.

1.3 PURPOSE AND NEED

The purpose of this Permit Application is to characterize the construction and operation of the proposed Class I Landfill for permitting and management purposes. The need for the landfill results from the expanding waste disposal requirements of the rapidly growing population in Northern Utah. Many of the existing landfills along the Wasatch Front are nearing closure or are under scrutiny due to encroachment of expanding urban areas. The proposed landfill would provide an alternative disposal option for the municipalities and counties of Utah, while offering the advantages of low operational cost, long-term capacity, and relatively low transportation costs. Participants through an interlocal agreement would have the opportunity to administer and manage the proposed landfill. Owner/Operator Contracts are included in Appendix A. Municipal solid waste (MSW) would be transported to the site by truck and/or railcar.

1.4 GENERAL INFORMATION

1.4.1 Facility Name

Promontory Landfill Facility

1.4.2 Facility Owner

Promontory Landfill L.L.C

1.4.3 Facility Operator

Pacific West, L.L.C.

1.4.4 Facility Size and Location

Facility Area, 2006 Acres more or less

Class I Landfill, approximately 1000 acres more or less

Promontory Point, Box Elder County, Utah

1.4.5 Types of Use

Class I Landfill

1.4.6 Contact Person

Mark Easton

1515 West 2200 South, Suite C

Salt Lake City, Utah 84119

Phone: 801-972-2727

Note: Mark Easton has been given legal authorization to sign for and in behalf of Pacific West, L.L.C. Refer to authorization letter included in Appendix A of this document.

CHAPTER II

FACILITY CHARACTERIZATION

2.1 GENERAL SETTING

The proposed landfill site is not currently zoned. A Conditional Use Permit was issued by Box Elder County Planning Department and is included in Appendix B. The entrance of the facility would be located at 41°12'55" north latitude and 112°28'05" east longitude.

2.2 FACILITY DESCRIPTION

Figure 2.1 shows the boundary of the 2006-acre facility covered by this Permit Application. The figure indicates the proposed buffer and disposal areas. The disposal area covers approximately 1000 acres and is bounded by a 1006-acre buffer area meeting State and Federal requirements.

2.3 PROOF OF OWNERSHIP AND FACILITY LEGAL DESCRIPTION

Figure 2.1 also details the ownership of lands surrounding the proposed landfill facility. As the figure indicates, Chournos Promontory and Young Resources, hold title to much of the adjacent property. Both of these owners are participants in Promontory Landfill LLC. Proof of ownership is included in Appendix C. The following is a property description of the proposed landfill facility:

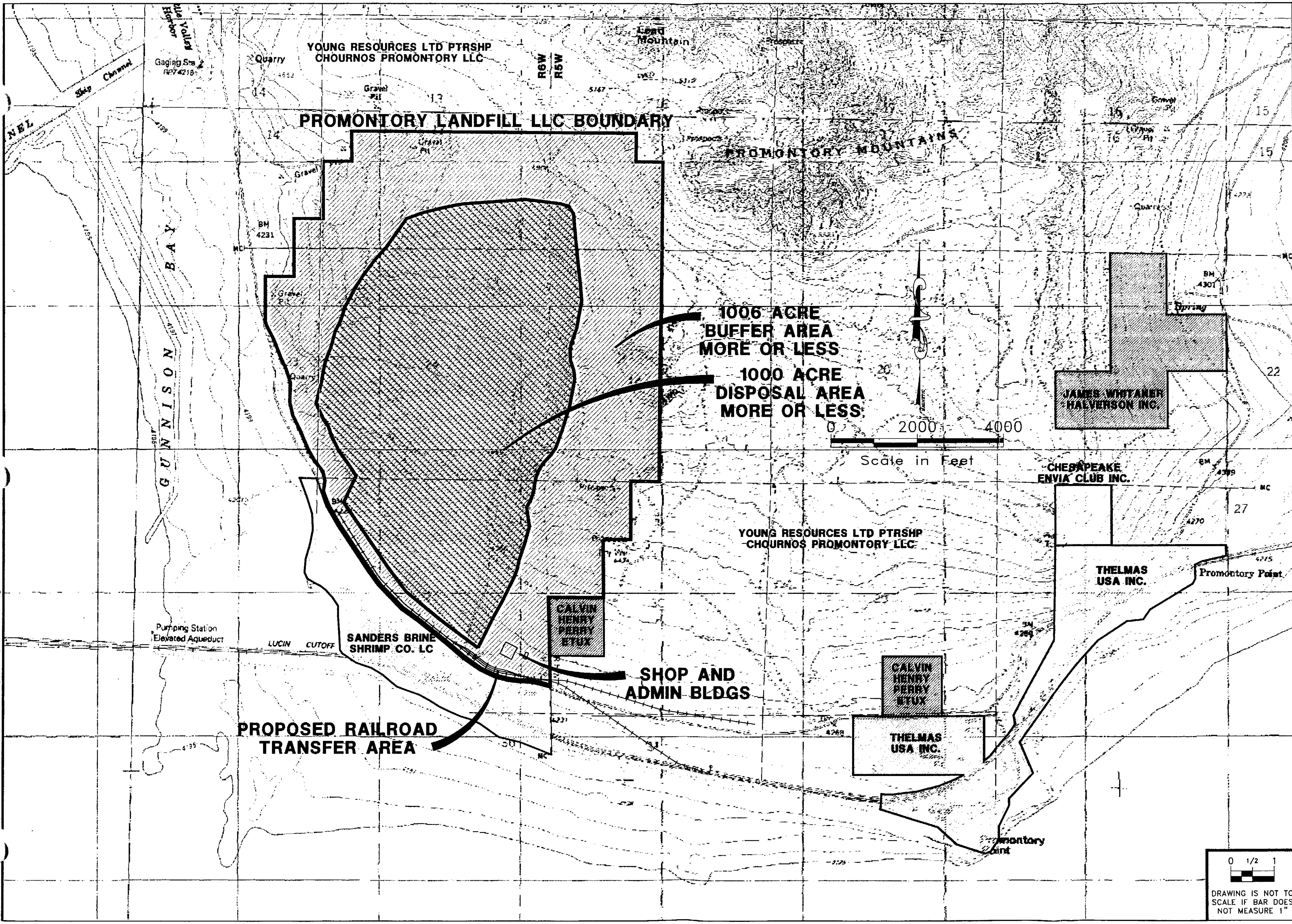
PROMONTORY LANDFILL PARCEL-2006 ACRES.

Property Description.

The real property situated in Box Elder County, Utah, more particularly described as follows:

The East half of the Northwest Quarter, Section 19, Township 6 North, Range 5 West, Salt Lake Base and Meridian.

The Southwest Quarter, Section 19, Township 6 North, Range 5 West, Salt Lake Base and Meridian.



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DATE: JULY 2003

ENGINEERS SEAL

REVISIONS

NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
LANDFILL AREA / OWNERSHIP MAP

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

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DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

FIGURE:
2.1

The Southwest Quarter, Section 19, Township 6 North, Range 5 West, Salt Lake Base and Meridian.

The West half of the Northeast Quarter, Section 30, township 6 North, Range 5 West, Salt Lake Base and Meridian.

The West half of the Northwest Quarter, Section 30, Township 6 North, Range 5 West, Salt Lake Base and Meridian.

The Southeast Quarter, Section 13, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

The Southeast Quarter of the Southeast Quarter of the Southeast Quarter, Section 14, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

The Northeast Quarter of the Northeast Quarter of the Northeast Quarter, Section 14, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

The South half of the Northeast Quarter of the Northeast Quarter, Section 23, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

The Southeast Quarter of the Northeast Quarter, Section 23, Township 6 North Range 6 West, Salt Lake Base and Meridian.
Less: The existing County Road and all the land lying Westerly of said County Road.

The Northeast Quarter of the Southeast Quarter, Section 23, Township 6 North, Range 6 West, Salt Lake Base and Meridian.
Less: The existing County Road and all land lying Westerly of said County Road.

The Southeast Quarter of the Southeast Quarter, Section 23, Township 6 North, Range 6 West, Salt Lake Base and Meridian.
Less: The existing County Road and all land lying Westerly of said County Road.

The Northeast Quarter, Section 24, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

The South half, Section 24, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

The Northeast Quarter, Section 25, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

The Southeast Quarter, Section 25, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

Less: The existing County Road and all land lying Southerly of said County Road.

The Southwest Quarter, Section 25, Township 6 North, Range 6 West, Salt Lake Base and Meridian.
Less: The existing County Road and all land lying Southwesterly of said County Road.

The Northwest Quarter, Section 25, Township 6 North, Range 6 West, Salt Lake Base and Meridian.
Less: The existing County Road and all land lying Southwesterly of said County Road.

The West half of the Southwest Quarter of Section 18, Township 6 North, Range 5 West, Salt Lake Base and Meridian.

The Southeast Quarter of the Southwest Quarter of Section 18, Township 6 North, Range 5 West, Salt Lake Base and Meridian.

The West half of the Northeast Quarter of the Southwest Quarter of Section 18, Township 6 North, Range 5 West, Salt Lake Base and Meridian.

The Southeast Quarter of the Northeast Quarter of the Southwest Quarter of Section 18, Township 6 North, Range 5 West, Salt Lake Base and Meridian.

The Northwest Quarter of the Northwest Quarter of Section 19, Township 6 North, Range 5 West, Salt Lake Base and Meridian.

The Southwest Quarter of Section 13, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

Less: The Northwest Quarter of the Northwest Quarter of the Southwest Quarter of Section 13, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

The Northwest Quarter of Section 24, Township 6 North, Range 6 West, Salt Lake Base and Meridian.

Together with all improvements, appurtenances and any water rights thereto belonging.

CHAPTER III
GEOHYDROLOGIC ASSESSMENT

3.1 GEOTECHNICAL AND GEOLOGIC STUDY

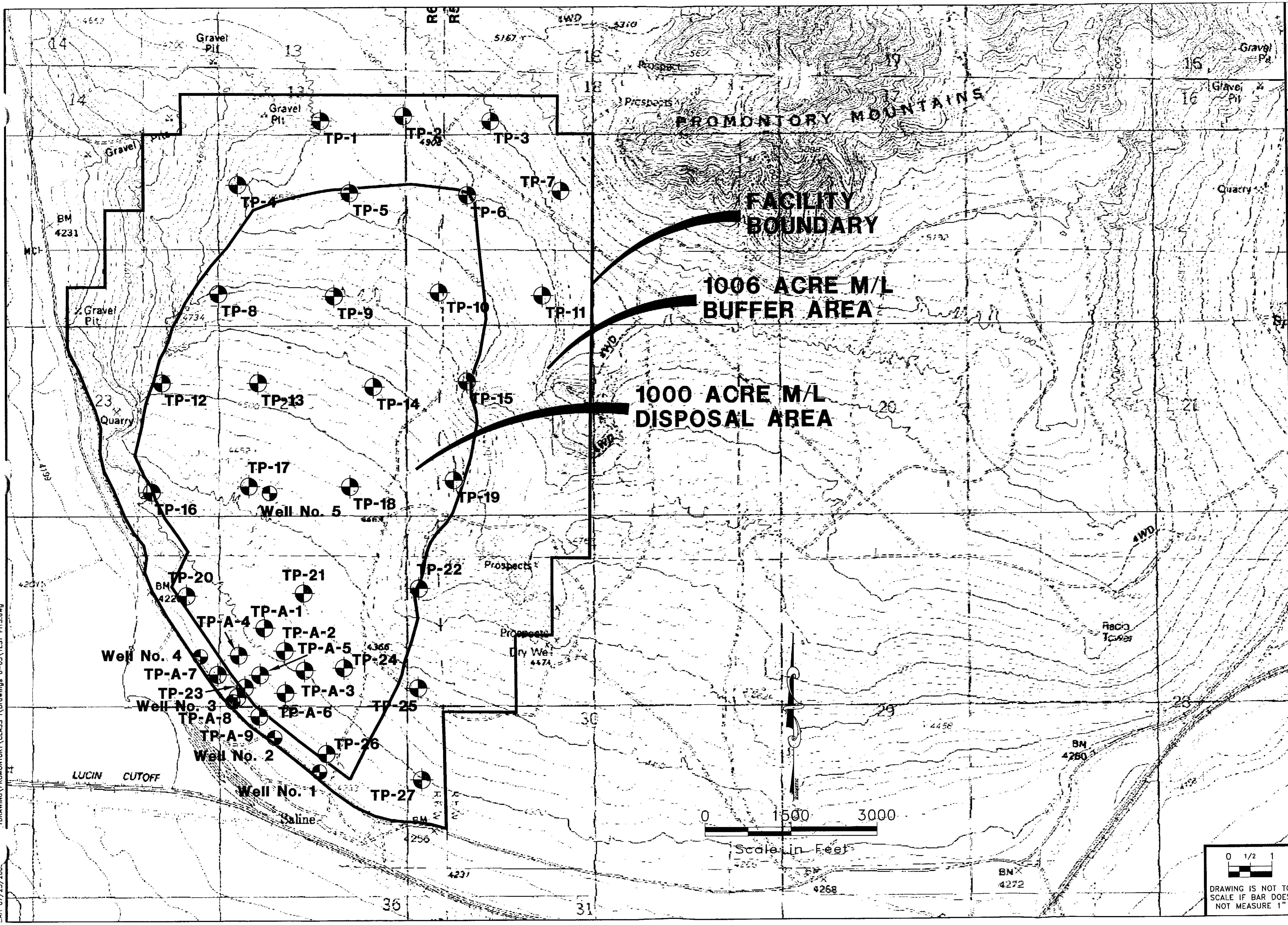
Applied Geotechnical Engineering Consultants, Inc. (AGEC) has supplied a Geotechnical and Geologic Study of the proposed Promontory Landfill site and found it suitable for the proposed landfill design. All conclusions not otherwise referenced in section 3.1 are conclusions of AGEC. The AGEC study in its entirety is included in Appendix D.

3.1.1 Subsurface Conditions

A total of 36 test pits and 5 groundwater monitoring wells were constructed at the landfill site as shown on Figure 3.1. Variations of subsurface conditions were found throughout the site. See Figures 3.2, 3.3, 3.4, and 3.5 for test pit sections and monitoring well logs. Many of the explorations consisted of 2-9 inches of topsoil overlaying clay or sand and gravel. Bedrock was encountered ranging at a depth of 1-41 feet throughout the site except at monitoring Well #1 in which bedrock was not discovered

3.1.2 Stability Analysis

The Regulations state that municipal landfills must be designed to withstand seismic accelerations if they are located in a seismic impact zone. A seismic impact zone is defined as an area with a 10% or greater probability that the maximum horizontal acceleration in lithified material would exceed 0.10 g in 250 years. According to Blake, T.F, et al. (2002), there is a 10% probability of ground acceleration exceeding 0.55 g in a 250-year period at the landfill site. The Promontory Landfill Facility is therefore located in a seismic impact zone. The proposed cell has been designed to remain stable while undergoing the predicted maximum earthquake accelerations. The results indicated a 50 percent probability that deformation would exceed 15 cm



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DATE: JULY 2003

ENGINEERS SEAL

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NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
SUBSURFACE EXPLORATION

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

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DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

FIGURE:
3.1
3-2

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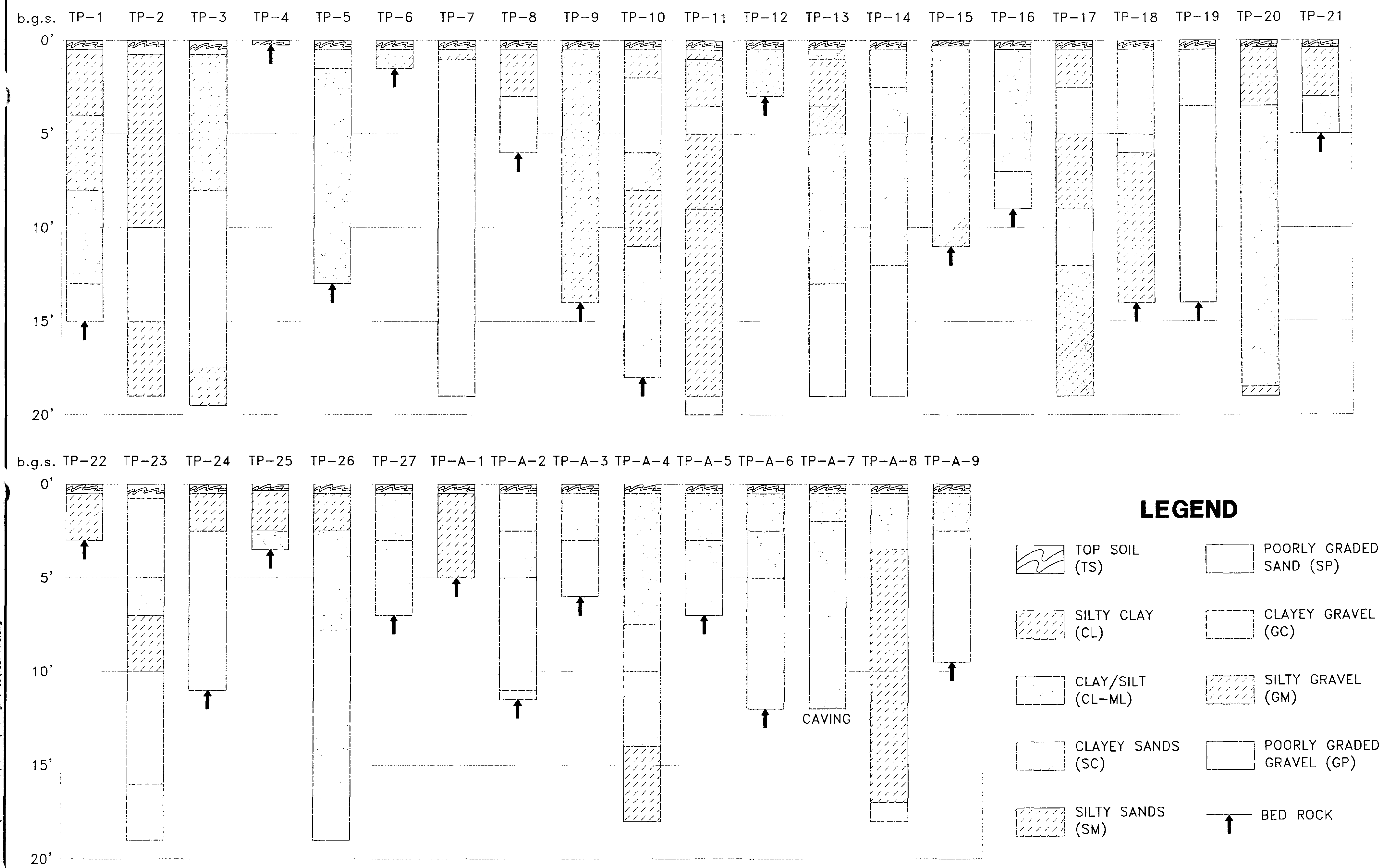

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DATE: JULY 2003

ENGINEERS SEAL

REVISIONS

NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
TEST PITS SECTIONS

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

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DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

FIGURE:
3.2
3-3

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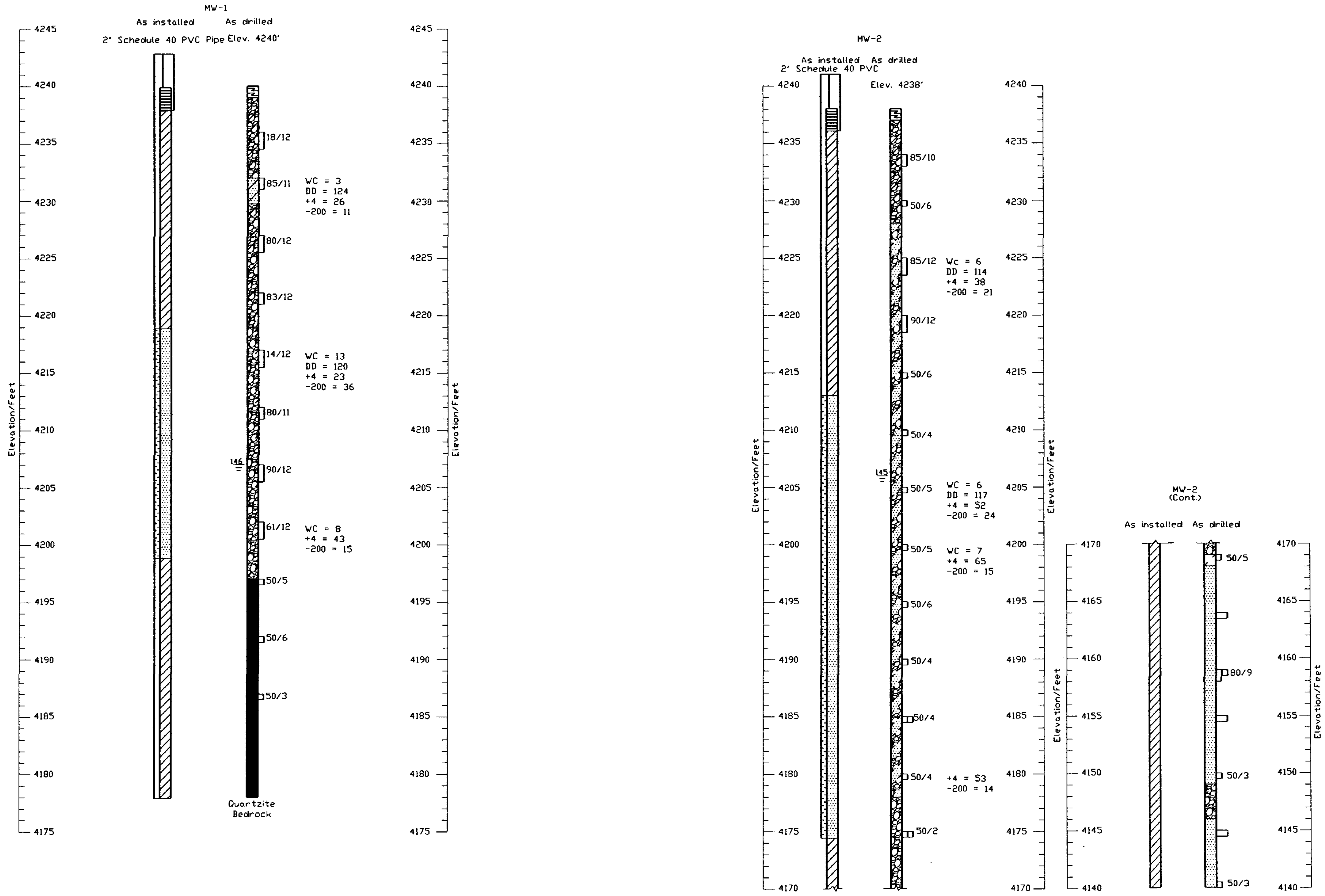

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SCALE: HORZ. AS SHOWN VERT. NONE
DATE: JULY 2003

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REVISIONS	
NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
MONITORING SCHEDULE
MONITORING WELL #1 AND WELL #2 WELL LOGS

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE:
3.3
3-4

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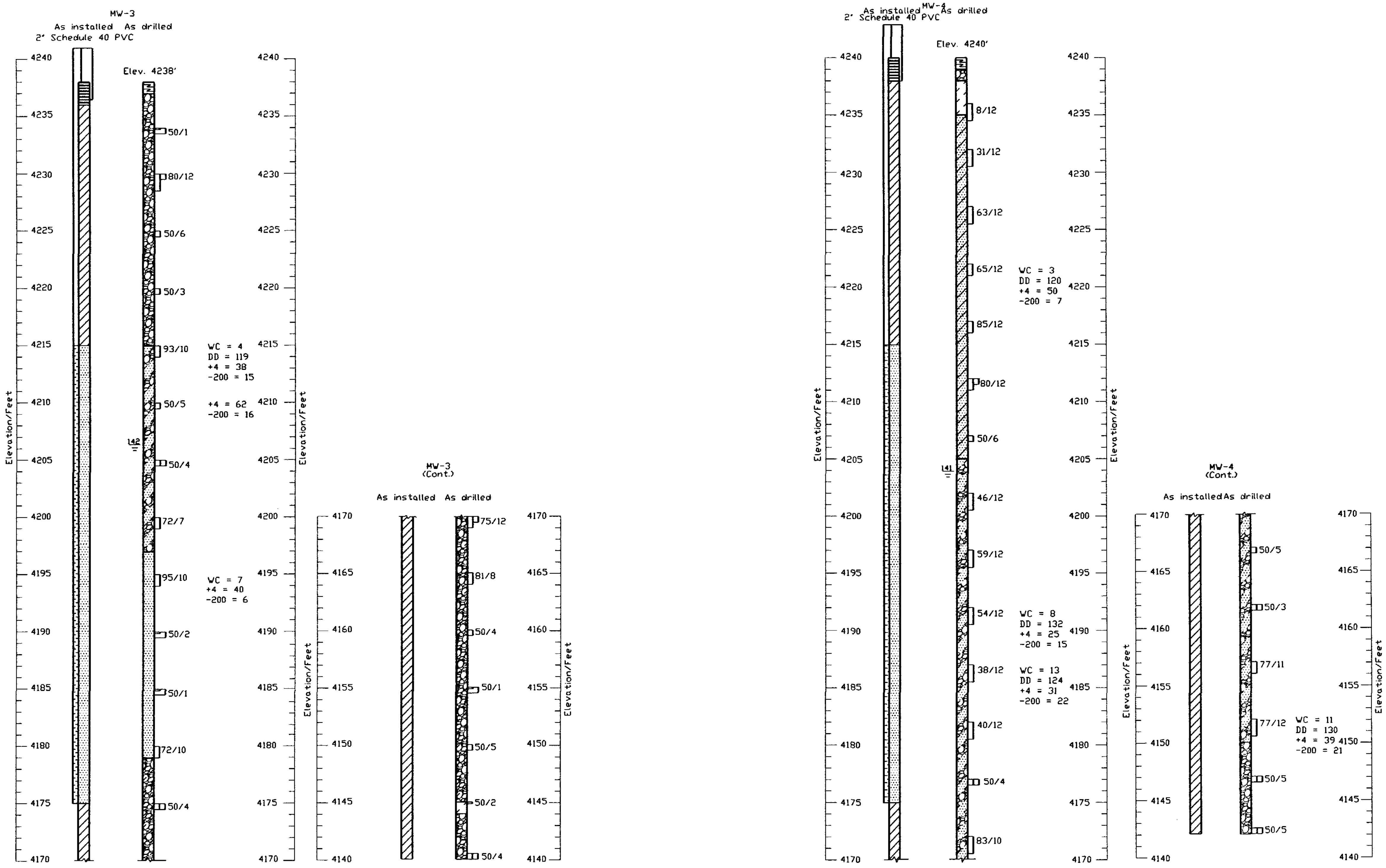

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DATE: JULY 2003

ENGINEERS SEAL

REVISIONS

NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
MONITORING SCHEDULE
MONITORING WELL #3 AND WELL #4 WELL LOGS

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

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FIGURE:
3.4
3-5

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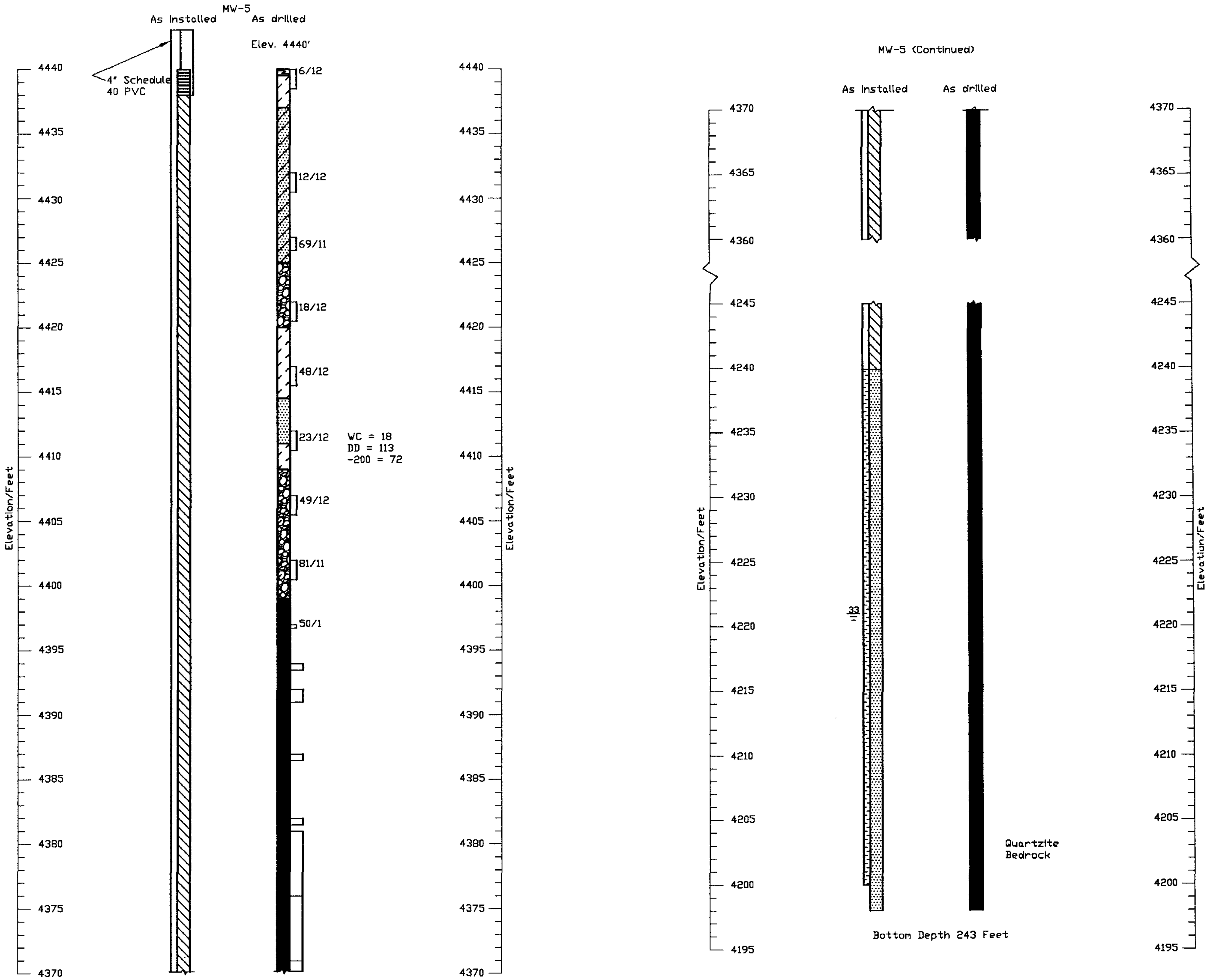

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DATE: JULY 2003

ENGINEERS SEAL

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PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
MONITORING SCHEDULE
MONITORING WELL #5 WELL LOGS

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

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DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

FIGURE:
3.5
3-6

SGS 07/25/200: 1DRAWING\PROMONTORY\CLASS I\Drawings 6-03\GRND WATER WELL LOGS.dwg for the proposed final cover design. Some movement of the slopes can be expected during an event of this magnitude. Friction angles for all the cover components shall be 25 degrees or greater, allowing the proposed cover design to be stable under both static and earthquake conditions.

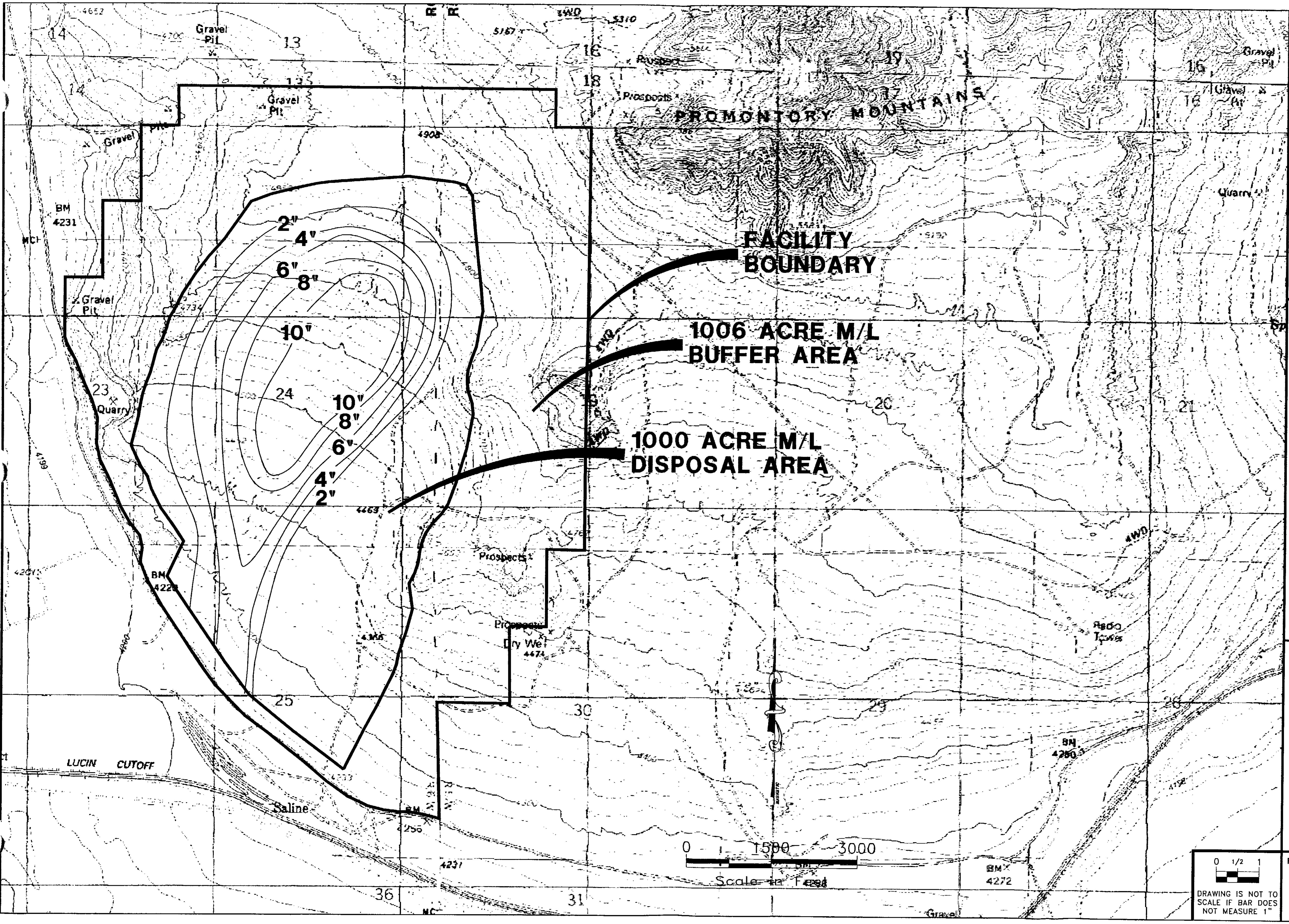
3.1.3 Settlement Calculations

Settlement calculations were performed for the proposed cell design. Settlement calculations throughout the site ranged from 0-10 inches for the overburdened soil and 0-6 inches for bedrock strain. These calculations were based on a final cover slope of 4 horizontal to 1 vertical and excavation and removal of the top 10 feet of site soil. Figure 3.6 shows the total estimated settlement of the proposed cell.

3.1.4 Geology

The Promontory Mountains are a part of the Basin and Range Province. The province is made up of north/south elongated mountain blocks and valleys. The Promontory Mountains form one of the mountain blocks in the province with the Great Salt Lake occupying a portion of the valleys on either side.

The valleys were once occupied by a large lake known as Lake Bonneville during the Wisconsin Glacial period of the Pleistocene Age. The present day Great Salt Lake is a remnant of ancient Lake Bonneville. Stillstands of Lake Bonneville formed benches along the margins of the mountain blocks. The highest level of Lake Bonneville is marked by a bench, the Bonneville shoreline, at approximate elevation 5280 feet. The lake remained at this high level from approximately 17,000 to 15,000 years before present (B.P.) until it dropped approximately 350 feet during a catastrophic flood known as the Bonneville Flood (Currey and Oviatt, 1985 and Jarrett and Malde, 1987). Two lower stillstands of Lake Bonneville are the Provo (approximately 13,000 years B.P.) and Gilbert (approximately 10,000 years B.P.) which formed at approximate elevations 4930 and 4330 feet, respectively (Currey and



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DATE:	JULY 2003

ENGINEERS SEAL

REVISIONS	
NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
PROMONTORY LANDFILL DESIGN
ESTIMATED SETTLEMENT

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

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DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

FIGURE:
3.6
3-8

others, 1983). The most recent high-water level, known as the Holocene High, occurred approximately 2,600 years B.P. with an approximate elevation of 4220 feet. The site is at an elevation ranging from approximately 4230 feet to 5200 feet, placing the site between just above the Holocene High to just below the Lake Bonneville shoreline.

3.1.5 Stratigraphy

The Quaternary sediments at the site consist predominantly of Lake Bonneville deposits with a thin veneer of alluvium and colluvium. Bedrock in the area consists of Cambrian and Pre-Cambrian-aged rock (Crittenden, 1988).

The Quaternary sediments consist predominantly of sand and gravel representing primarily transgressive phases of Lake Bonneville shoreline deposits. Some clay was encountered at the site, which generally represents deeper lake sediments deposited during the high stands of Lake Bonneville.

Four bedrock formations have been mapped within the property boundaries. The youngest of these deposits is the middle and lower Cambrian-aged limestone and shale consisting of interbedded, thin-bedded, medium-gray, limestone and olive-drab shale.

The interbedded limestone and shale is underlain by lower Cambrian-aged Geertsen Canyon Quartzite, which consists of deep reddish-black hematitic quartzite.

The Geertsen Canyon Quartzite is underlain by the late Proterozoic-aged Browns Hole Formation which consists of pale-gray, very-fine-grained, vitreous quartzite.

The late Proterozoic-aged Mutual Formation underlays the Browns Hole Formation and consists of thick-bedded, coarse-grained quartzite intercalated with a few beds of siltstone and shale.

3.1.6 Structure

Due to the age of the bedrock, the bedrock is highly faulted, fractured and deformed. The attitude of beds varies significantly across the site. The dip of beds northeast of the site is generally down toward the northeast with a dip angle ranging from 30 to 45 degrees.

3.1.7 Tectonic Setting

The Promontory Mountains are bounded on the west by a fault known as the East Great Salt Lake Fault (Hecker, 1993). The fault is mapped to extend within approximately 800 feet west of the west edge of the property. The East Great Salt Lake Fault is considered to have had movement within the Quaternary and possibly within the Holocene time period. Quaternary slip rates for the East Great Salt Lake Fault are estimated to be on the order of 0.4 to 0.7 millimeters per year, which is approximately half the slip rate for the Wasatch Fault (Pechmann, 1987).

A recent study (Dinter and Pechmann, 1998) using seismic reflection methods found the East Great Salt Lake Fault to be approximately 2 miles west of the southwest edge of the property.

3.1.8 Geologic Hazards

Geologic hazards reviewed for the project consist of surface fault rupture, ground shaking, landslide, debris flow, rockfall, subsidence, dam failure flood, mining activity, salt dome and salt bed.

1. <u>Surface Fault Rupture Hazard</u>
   As indicated above, the East Great Salt Lake Fault is estimated to extend within approximately 2 miles west of the southwest edge of the property.

There is no surface evidence of the fault based on a reconnaissance of the area. The presence of the fault is based on seismic reflection surveys performed by Dinter and Pechmann at the Great Salt Lake.

Based on the topography of the area, the East Great Salt Lake Fault would have relative movement down on the west. We would not anticipate shallow bedrock to be encountered on the west side of the fault. Based on this reasoning, the fault is located west of the road along the west edge of the property. Surface fault rupture is not considered a hazard at the site.

2. Earthquake Ground Shaking

Ground shaking due to large earthquakes in the area is a potential hazard at the site. Studies performed by the U.S. Geological Survey would indicate that a probabilistic ground motion of 0.55g would have a 2 percent probability of occurrence in a 50-year period.

3. Landslide

There are no mapped landslides on the property based on a review of the landslide map of the Promontory Point 30 minute by 60-minute quadrangle (Harty, 1992). Some landslides are mapped north of the site in Little Valley.

Based on a reconnaissance of the site and the subsurface conditions encountered in the test pits excavated at the site, landslide is not considered a hazard for the proposed development.

4. Debris Flow

There are no significant drainages, which extend through the site and no source for debris flow upgradient of the site. Debris flow is not considered a hazard for the proposed development.

5. Rockfall

The source of rock for rockfall is steep rock outcrops at Lead Mountain to the northeast of the site and minor rock cliffs and bedrock outcrops in the southeast portion of the site. None of these rockfall sources are significant enough to pose a hazard for the proposed development.

6. Subsidence

The overburden soil at the site generally has low compressibility characteristics. The bedrock in the area consists predominantly of quartzite, which has low solubility. The limestone, which is present in the northeast portion of the site, shows no evidence of caverns or other solution features of significance. A reconnaissance of the site found no evidence of depressions or other subsidence features. Subsidence due to dissolution of the limestone bedrock is not considered a potential hazard at the site.

7. Dam Failure Flooding

There are no dams upgradient of the site. Thus, dam failure flooding is not considered a hazard.

8. Mining Activity

The Promontory Mountains have been mined for lead in the past. There are mine prospects northeast of the site at and around Lead Mountain. Gravel and riprap for construction of the railroad causeway have been mined in the northwest portion of the property. There are some mine prospects in igneous dikes, which cut through the Mutual Formation in the northwest portion of the site. Most mine prospects in the area appear to be shallow explorations with no evidence of significant underground mining due to the lack of mine spoil piles of significance. Two mineshafts were identified by the Utah Division of Oil, Gas and Mining in 1986 just east of the gravel quarries in the northwest portion of the site. Mine related hazards are not considered a concern for the proposed development.

9. <u>Salt Domes and Beds</u>

Based on a reconnaissance of the site and subsurface exploration, there is no evidence of significant salt deposits on the property. Salt deposits are not expected with the type of bedrock encountered at the site. Salt domes and salt beds are not considered a hazard for the proposed development.

3.2 GEOHYDROLOGY

3.2.1 Regional Geohydrology

"Precipitation on the Promontory Point Mountains area is estimated to average 240,000 acre-feet annually. Of this amount, about 93 percent is consumed at or near the point of fall, because most of the precipitation falls on low altitude areas where the rate of precipitation is small, air temperatures are relatively high, and soil moisture requirements are high" (Hood, 1972).

An estimated 5 percent of the total precipitation in the drainage area serves as recharge to the groundwater storage. Only the higher elevations on Promontory Point receive amounts of precipitation that exceed the area's gross consumptive use to produce runoff. The estimated annual direct runoff from the Promontory Point is 2,000 acre-feet.

The quality of the groundwater is poor and is a critical limiting factor for future development. The majority of the water from Promontory Point is very hard consisting of dissolved salt concentrations as high as 25,000 milligrams per liter. The high salt concentration creates a hazard for irrigation. The limited fresh water available on Promontory Point is obtained through wells and springs on the northern exposures of Promontory Mountains with salts concentrations as low as 300 milligrams per liter. The primary use of water on Promontory Point is livestock watering.

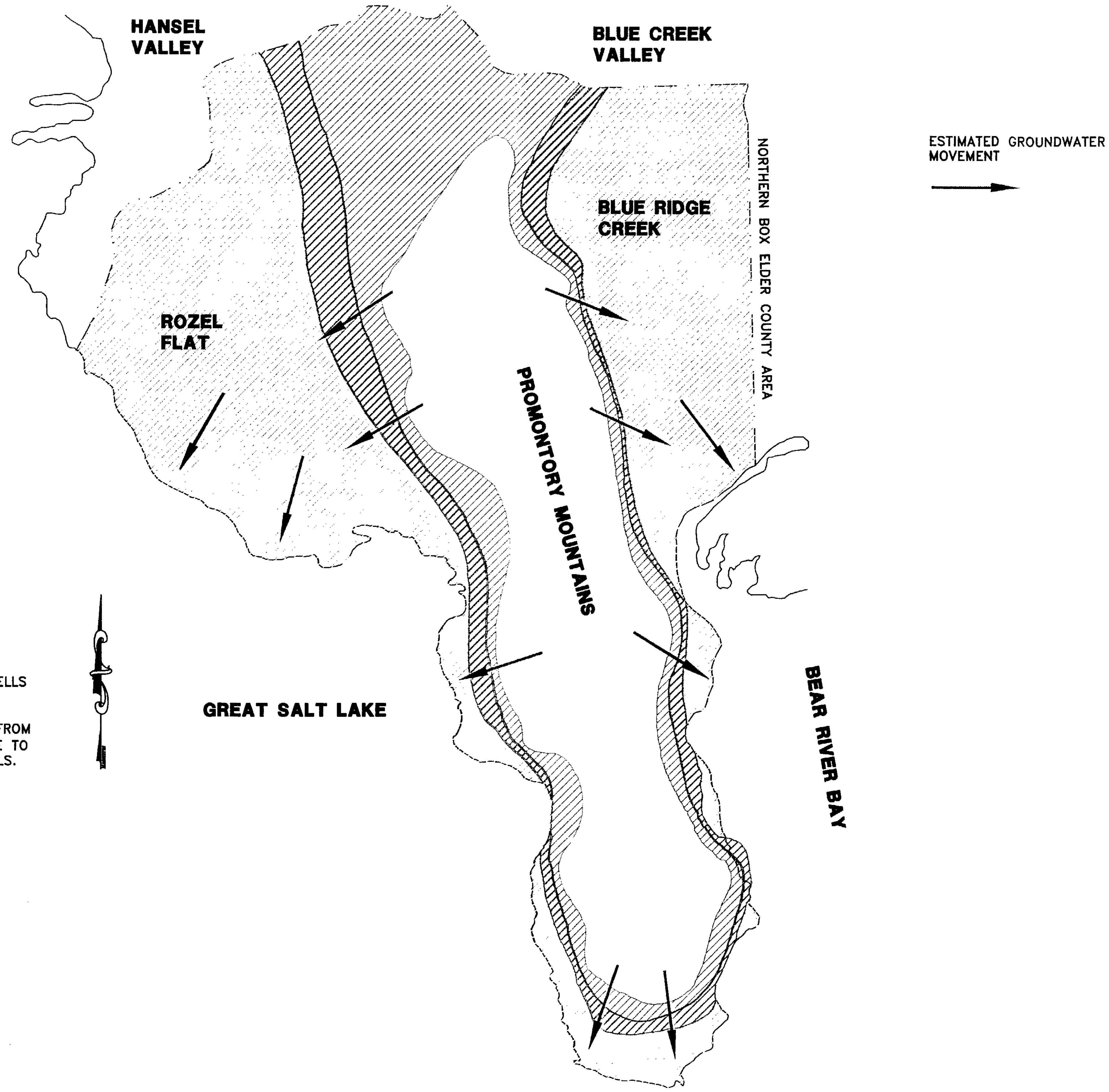
Fresh water for consumption will be supplied by bottled water. Sewage generated at the site will be treated using a septic system. Box Elder County has issued a letter stating that the site is suitable for septic systems. Site water and fire suppression water will be obtained from water sources near the site. An existing spring near the site is already equipped with a tank, but will need to be further developed to meet the proposed facility demand. Water would be gravity feed through proposed piping to the points of use.

Groundwater in the Promontory Point area is not considered a discrete hydrologic unit. It is most uniformly available from the rocks of Cenozoic age (Hood, 1972). These reservoirs of water consist in sedimentary rocks both consolidated and unconsolidated. Other groundwater reservoirs are located in consolidated rock of the Paleozoic and Precambrian age. The groundwater reservoirs in the consolidated rocks are thought to be connected hydraulically and receive flows from areas to the north.

The aquifer is not considered as a sole source aquifer and the groundwater is not classified as a Class IB under Section R317-6-3.3. The general direction of groundwater movement is from the recharge areas westward toward the Rozel Flat and thence southward toward the Great Salt Lake. Water is also thought to move eastward from the Promontory Point Mountains and southward from the Blue Creek Valley area toward Bear River Bay. See Figure 3.7 for the general direction of groundwater movement.

3.2.2 Local Geohydrology

The depth to groundwater at the site ranges from 33-35 feet near the south end of the proposed facility, 250 feet near the center, and about 500 feet near the northern end of the facility. Depth of groundwater throughout the site was estimated using information from the monitoring wells.



NOTE:
USING WATER ELEVATIONS AT MONITORING WELLS #4 AND #5, THE HYDRAULIC GRADIENT WAS CALCULATED AT 0.023 ft/ft. THE GROUND WATER FLOW RATE IS EXPECTED TO RANGE FROM 0.3 – 0.00001 gpm/ft sq AT THE SITE DUE TO THE VARIABILITY OF ROCK AND ALLUVIAL FILLS.

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DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

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SCALE: HORZ.	1" = 2000'
VERT.	NONE
DATE:	JULY 2003

ENGINEERS SEAL

REVISIONS	
NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
GROUND WATER MOVEMENT

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE:
3.7

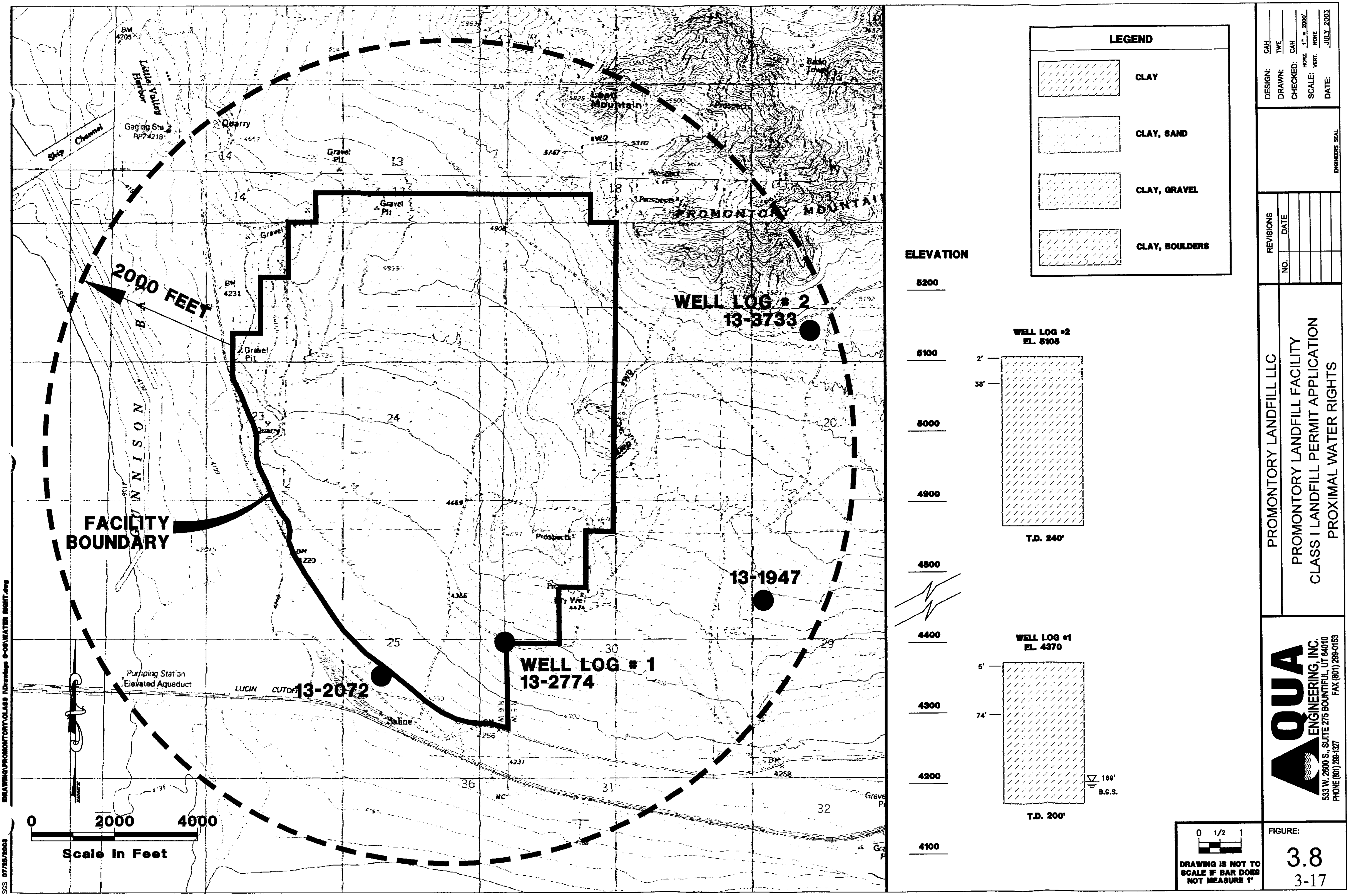
A water right search of the area surrounding the proposed Promontory Landfill Facility using the Utah Division of Water Rights database was initiated to identify proximate water right applications on file in the State Engineer's office. Within 2000 feet of the facility boundary, four water rights were identified. These water sources are shown on Figure 3.8 and the water right information is included in Appendix E.

- Water right # 13-2072 point of diversion is described as 1900 feet north and 350 feet west of the south quarter corner of Section 25, Township 6 North, and Range 6 West, SLBM. Little is know about the construction of the underground water well that has a priority starting in 1930 for livestock watering. No well driller's report was available.

- Water right # 13-2774 point of diversion is described as 2700 feet north and 100 feet west from the southeast corner of Section 25, Township 6 North, and Range 6 West, SLBM. This 6 inch underground water well was completed in 1972, to a total depth of 200 feet. Figure 3.4 details the cross sectional lithology and the reported 169 b.g.s. to the static water table.

- Water right # 13-1947 point of diversion is described as 1600 feet south and 1000 feet east from the northwest corner of Section 29, Township 6 North, Range 5 West, SLBM. Priority for the water right dates back to 1930. Without a well drillers log, little is known about the underground water well.

- Water right # 13-3733 point of diversion is described as 535 feet south and 2112 feet east from the northwest corner of Section 20, Township 6 North, Range 5 West, SLBM. The underground well was abandoned after drilling to a depth of 240 feet without encountering water. Figure 3.4 depicts information gathered from the well log.


2000 FEET
FACILITY BOUNDARY
WELL LOG # 2
13-3733
13-1947
WELL LOG # 1
13-2774
13-2072
PROMONTORY MOUNTAIN
Little Valley Harbor
Gaging Sta
Quarry
Gravel Pit
Prospects
Pumping Station
Elevated Aqueduct
LUCIN CUTOFF
Saline
0 2000 4000
Scale In Feet
ELEVATION
5200
5100
5000
4900
4800
4400
4300
4200
4100
LEGEND
CLAY
CLAY, SAND
CLAY, GRAVEL
CLAY, BOULDERS
WELL LOG #2
EL. 5105
2'
38'
T.D. 240'
WELL LOG #1
EL. 4370
5'
74'
169'
B.G.S.
T.D. 200'
DESIGN: CAH
DRAWN: TWE
CHECKED: CAH
SCALE: HORZ. 1" = 2000' VERT. NONE
DATE: JULY 2003
REVISIONS
NO. DATE
ENGINEERS SEAL
PROMONTORY LANDFILL LLC
PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
PROXIMAL WATER RIGHTS
AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153
0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"
FIGURE:
3.8

3.3 SURFACE WATER

There are no perennial streams located near the site. Intermittent flows occur on the site and surrounding areas during times of rainfall or snow melt. Most of storm runoff at the site is received from the hills to the north and northeast. The nearest perennial stream is Blue Creek, located approximately 20 miles to the northeast, which flows most of the year and is fed by large springs discharging an estimated peak flow of 3 cubic feet per second.

CHAPTER IV
ENGINEERING REPORT

4.1 REGULATORY CONFORMANCE

The engineering plans and specifications contained in this application have been developed to satisfy the regulations that have been set forth by the State of Utah and the EPA.

4.2 DEVELOPMENT IMPACTS

Based on the effected environment, the proposed design, and the operational protocol, the Class I Landfill would have no significant impact to human health, safety, and the environment of the surrounding area including surface and groundwater resources.

4.3 SITE INVESTIGATIONS

Both subsurface and surface investigations were conducted starting in December 2002 and concluded in July 2003. During this period a total of 36 test pits and 5 monitoring wells were constructed and an evaluation of wildlife and cultural resources was conducted. Field notes from subsurface investigations are included in Appendix D. Environmental and cultural resource studies are located in Appendix F.

4.4 LOCATION STANDARDS

The Rules require that Class I Landfills comply with certain location standards. These standards are intended to minimize potential impacts to surrounding lands, the environment, surface and groundwater resources, cultural and social resources, and human health. Environmental and cultural resource studies along with comments from the United States Fish and Wildlife Service and the State of Utah Division of Natural Resources are included in Appendix F.

4.4.1 Land Use Compatibility

The landfill and related facilities conform to the following general location standards outlined in R315-302. Some of these standards have been identified below:

a. The site is not located within a 1000 feet of a national, state or county park, monument, or recreational area; designated wilderness or wilderness study area; or wild or scenic river area.

b. The site is not located in an ecologically and scientifically significant natural area, including public wildlife management areas and habitat for threatened or endangered species as designated pursuant to the Endangered Species Act of 1982.

c. The site is not in farmland classified or evaluated as "prime," "unique," or of "statewide importance" by the U.S. Department of Agriculture Soil Conservation Service under the Prime Farmland Protection Act.

d. The site is not within a ¼ mile of any existing permanent dwellings, residential areas, and other incompatible structures such as schools or churches. The nearest dwelling is several miles away.

e. A cave/rockshelter was located near the cell development area. The Owner has selected to include the cave/rockshelter within the buffer area to ensure its preservation. The Owner will not be mining of soils near the cave/rockshelter and will try to protect it from vandals by close observations. See Figure 4.1 on page 4-5 for location.

f. The site is not within 10,000 feet of any airport runway used by turbojet aircraft or within 5,000 feet of any airport runway used by only piston-type aircraft. A landing strip used by the brine shrimp operations is located approximately 8,000 feet southeast of the proposed landfill facility. The landing strip is used primarily only during the brine shrimp harvest season.

g. The site is not within 1,000 feet of any public highway. The nearest state highway is almost 16 miles from the proposed facility.

h. The site is not located on any public land that is being used by a public water system for municipal drinking water purposes. The site is not located within a watershed used by a water system

i. The site is not located in a 100-year flood plain.

j. The site will not violate any applicable state water quality standard or section 307 of the Clean Water Act.

k. The site is not located in any wetlands and thus will not contribute to significant degradation of wetlands.

4.4.2 Seismic Stability

The Regulations state that municipal landfills must be designed to withstand seismic accelerations if they are located in a seismic impact zone. A seismic impact zone is defined as an area with a 10% or greater probability that the maximum horizontal acceleration in lithified material would exceed 0.10 g in 250 years. According to Blake, T.F, et al. (2002), there is a 10% probability of ground acceleration exceeding 0.55 g in a 250-year period at the landfill site. The Promontory Landfill Facility is therefore located in a seismic impact zone. The proposed cell has been designed to remain stable while undergoing the predicted maximum earthquake accelerations. The results from AGEC Geotechnical and Geologic Study indicate that small to moderate displacement is likely under the seismic condition with predicted movement on the order of 15 centimeters for the 4 horizontal to 1 vertical slope.

Friction angles for cover components shall be 25 degrees or greater allowing the proposed design to be stable under both static and earthquake conditions.

4.5 DESIGN APPROACH AND OBJECTIVES

The design approach for the proposed Class I Landfill was based on the Regulations, which state that the following factors shall be considered for the approval of a design:

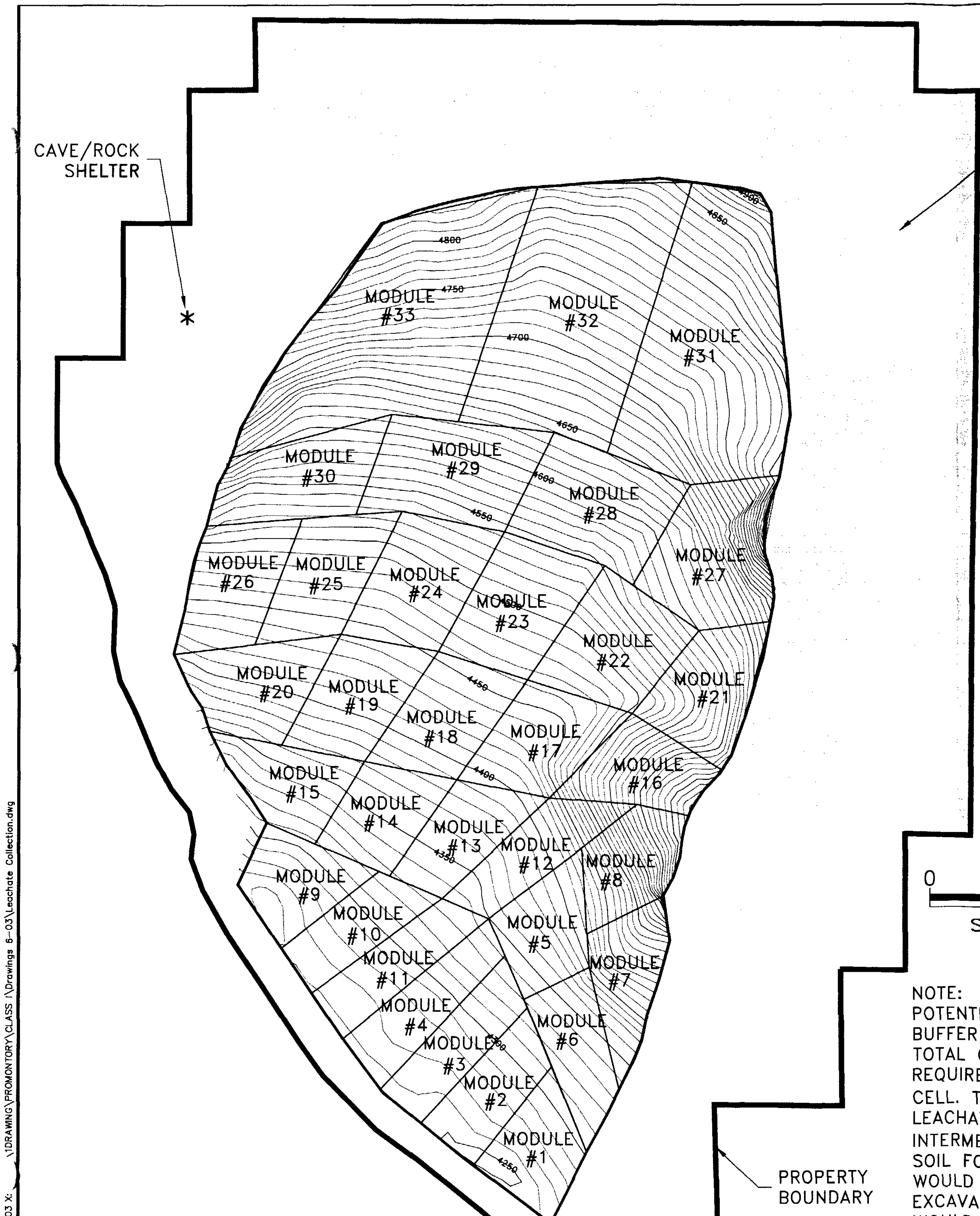
- Minimize liquids admitted in the landfill
- Design of a leachate collection system
- Liner design
- Cover design
- Gas control
- Any other relevant factors

Final construction plans and specifications, including quality control and quality assurance plans, must be approved by the Executive Secretary prior to the start of construction of any structure or feature of the landfill.

4.5.1 General Cell Design

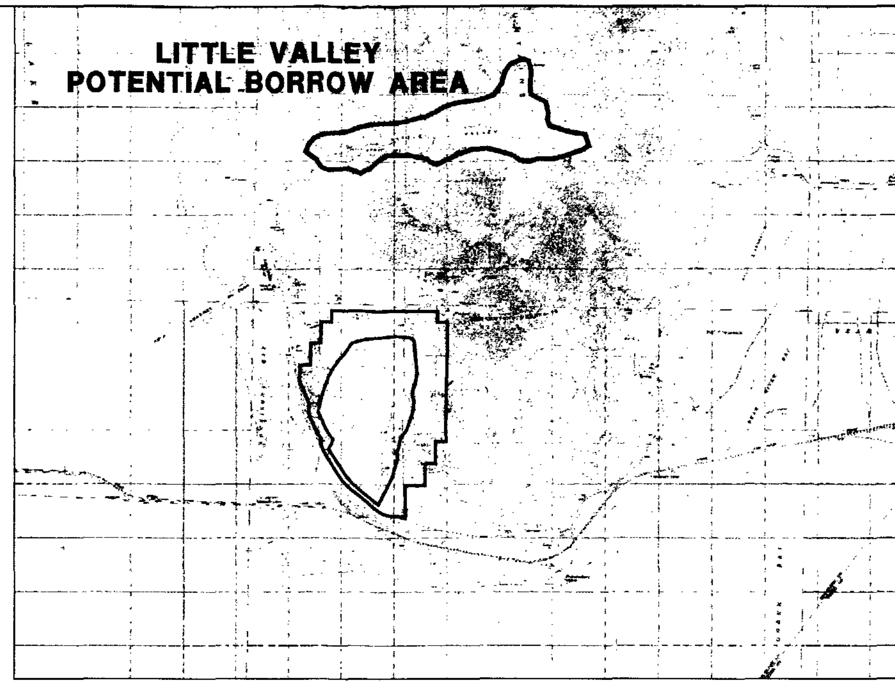
The Class I disposal cell was designed to protect the waters of the state from degradation by pollutants or contaminants by maximizing evapotranspiration, minimizing percolation of water through the landfill, and diverting surface water run-on and run-off.

The proposed disposal cell would be separated into modules as indicated on the excavation plan as previously shown on Figure 4.1. The life expectancy of each module is also indicated. Figure 4.2 shows the module development plan using the area fill method of construction. This method involves excavation of a defined area,



EXCAVATION PLAN

SCALE: 1"=1200'



MAGNETIC

0 1200 2400

Scale in Feet

NOTE:
POTENTIAL BORROW AREAS INCLUDE THE BUFFER ZONE AND LITTLE VALLEY. A TOTAL OF 30 MILLION YARDS WOULD BE REQUIRED FOR THE 1000 ACRE DISPOSAL CELL. THIS INCLUDES THE 24" GRAVEL LEACHATE COLLECTION SYSTEM, INTERMEDIATE COVER, AND 18" OF SITE SOIL FOR FINAL COVER. 14 MILLION YARDS WOULD BE OBTAINED FROM CELL EXCAVATION AND 17 MILLION YARDS WOULD BE OBTAINED FROM POTENTIAL BORROW AREAS.

MODULE NO.	ACRES	LIFE EXPECTANCY
1	20	2-3
2	20	3-4
3	20	2-3
4	20	2-3
5	20	3-4
6	20	3-4
7	20	2-3
8	20	2-3
9	20	2-3
10	20	2-3
11	20	3-4
12	20	3-4
13	20	5-6
14	20	5-6
15	20	4-5
16	20	2-3
17	25	5-6
18	25	5-6
19	25	5-6
20	25	3-4
21	25	2-3
22	30	4-5
23	30	5-6
24	30	5-6
25	25	4-5
26	25	3-4
27	35	2-3
28	35	5-6
29	35	5-6
30	30	3-4
31	85	4-5
32	90	5-6
33	90	4-5

0 1/2 1

DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

DESIGN: CAH
DRAWN: TWE
CHECKED: CAH
SCALE: HORZ. AS SHOWN VERT. NONE
DATE: JULY 2003

ENGINEERS SEAL

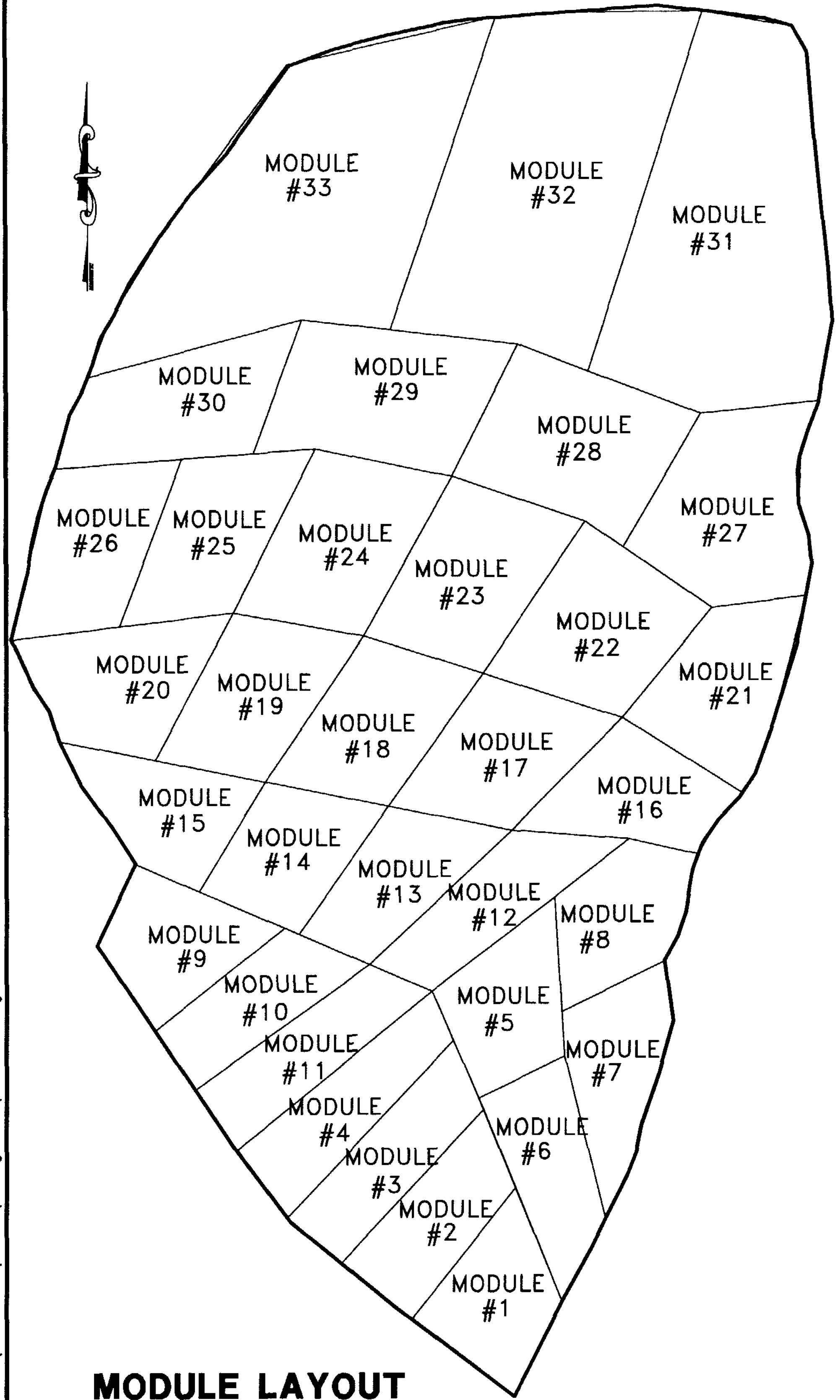
REVISIONS		
NO.	DATE	

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
PROMONTORY LANDFILL DESIGN
EXCAVATION PLAN

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

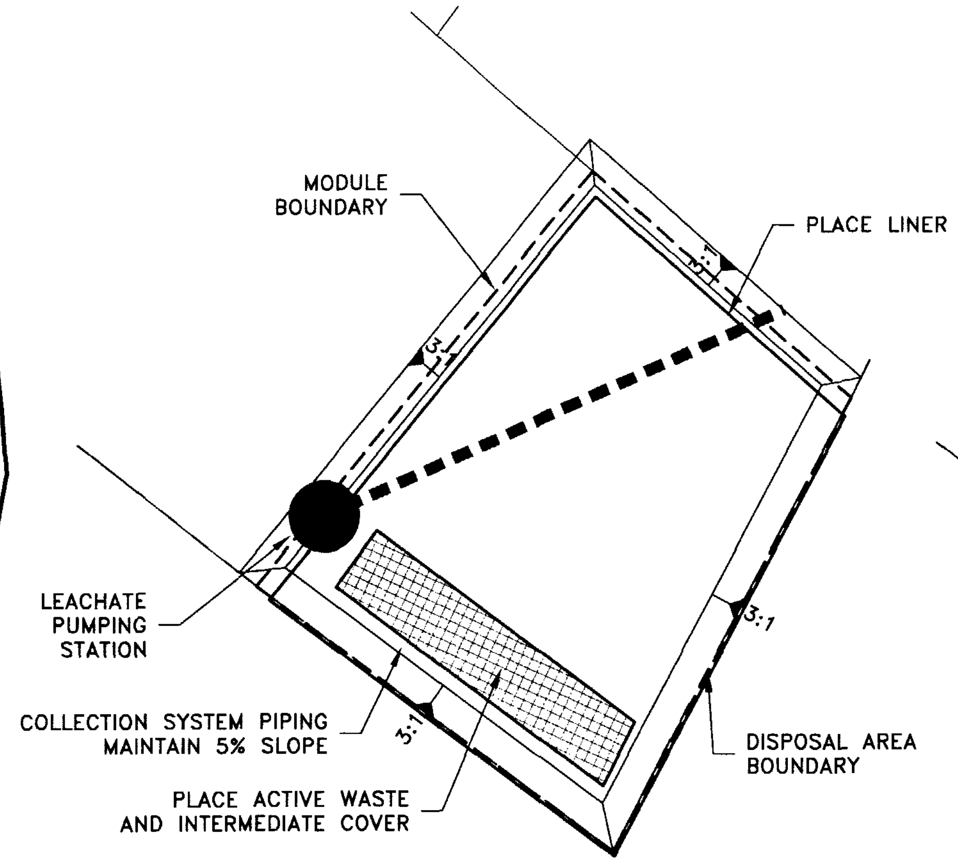
FIGURE:
4.1



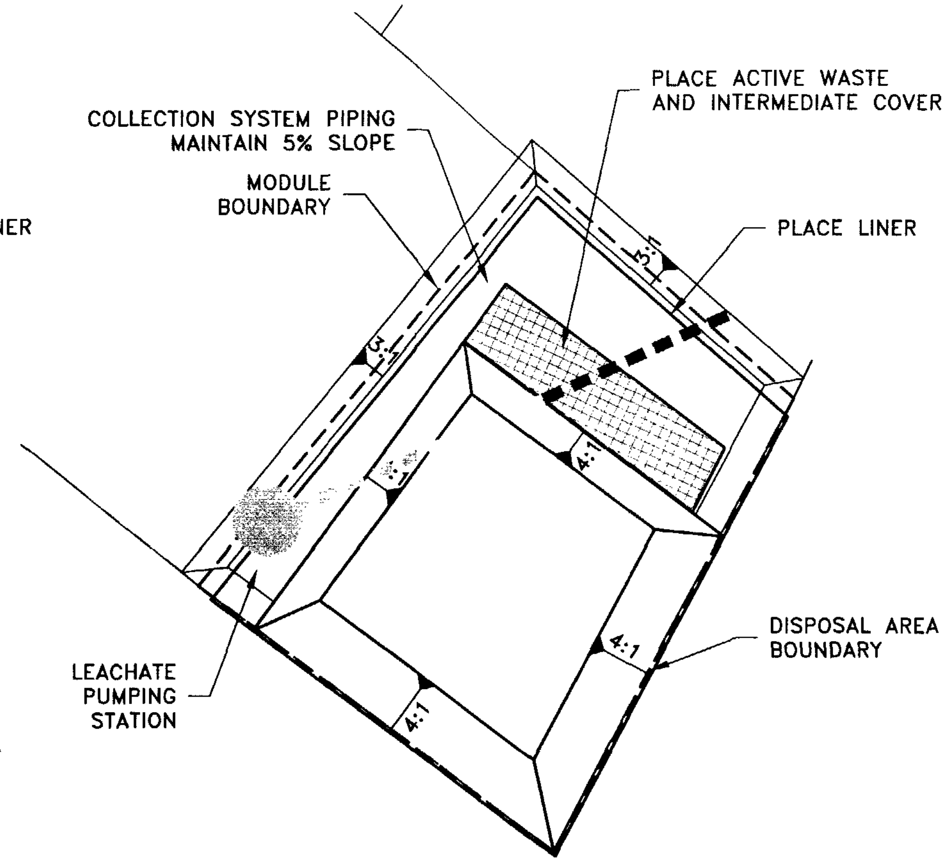
MODULE LAYOUT

SCALE: 1"=1200'

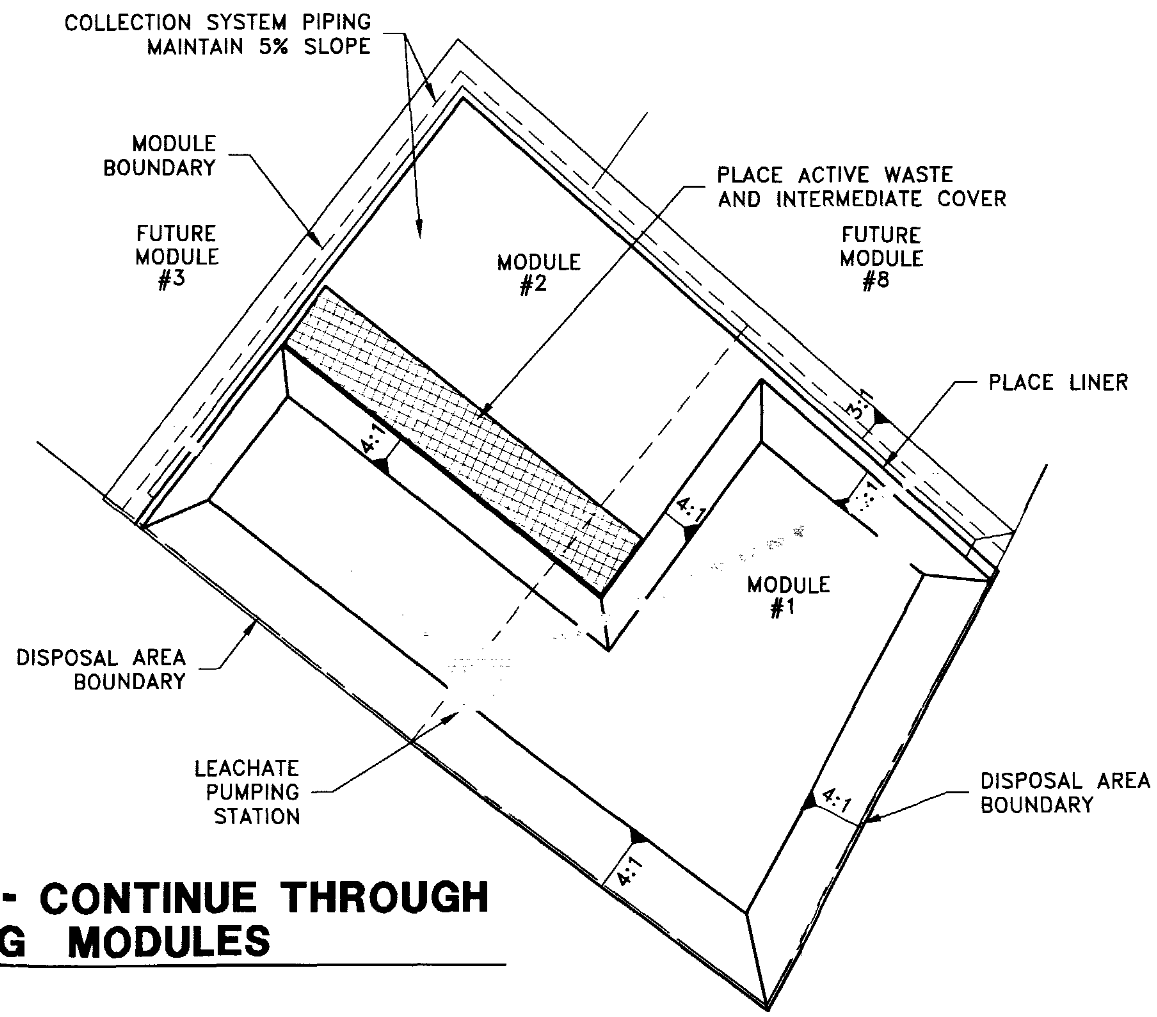
0 1200 2400
Scale in Feet



PHASE 1



PHASE 2



PHASE 3 - CONTINUE THROUGH REMAINING MODULES

0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

DESIGN: CAH
DRAWN: TWE
CHECKED: CAH
SCALE: HORZ. AS SHOWN VERT. NONE
DATE: JULY 2003

ENGINEERS SEAL

REVISIONS	
NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
PROMONTORY LANDFILL DESIGN
MODULE DEVELOPMENET PLAN

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PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE:
4.2
4-6

TWE 09/29/2003 X:\SHARE\1DRAWING\PROMONTORY\CLASS I\Drawings 6-03\CELL DEVEL.dwg installation of a liner, leachate collection system, gravel protection layer, select waste layer, and placement of refuse in conjunction with the installation of a gas collection system. The module would consist of excavated slopes of 3 horizontal to 1 vertical and cover slopes of 4 horizontal to 1 vertical. The liner components would be placed outside the proposed module area for future connection. The gravel protection layer would be constructed using screened site soils. Select waste would exclude any items that may compromise the liner system. Select waste is typically obtained from residential MSW collection. Refuse would be placed in layers and compacted to minimize the potential for settlement. A drainage berm would be constructed around the module to help divert run-on away from the refuse.

The refuse would be covered daily with 6 inches of soil or with an Executive Secretary approved alternative daily cover. Soil would be the primary means for daily cover and would be obtained from either exhumed soil from future modules or imported soils from the borrow areas or other near by sites. An estimated 33 million yards of soil would be required for the gravel component of the liner, intermediate cover, and an 18" layer of soil for the final cover. An estimated 16 million yards would be obtained through cell excavation and the remaining 17 million yards through import from nearby borrow areas. Gravel for the liner and possible import fill could be obtained at or near the site in the surrounding gravel pits.

An intermediate cover consisting of 12 inches of soil or an approved alternative would be applied to any working face not receiving waste for a period exceeding 30 days.

4.5.2 Liner

The liner system was designed to prevent pollutants and contaminates from escaping the landfill. In order for the liner system to be successful it cannot leach or fail due to settlement, puncture, or seismic activity. The liner would consist of a clay layer, HDPE layer and a geotextile mat. The clay layer would be placed on native soils, which are free of stones or other matter whose size, and shape could puncture the clay layer. A clay layer with specifications equivalent to or greater than the physical properties of Bentomat (ST) would be used. See Appendix G for Bentomat (ST) specifications and a letter from the manufacturer certifying that the material would be able to perform properly under the conditions imposed by the Promontory Landfill design. The HDPE layer would be 60 mil or thicker to minimize puncture risk. The HDPE layer would be welded at all seams to provide containment. A specification for a 60 mil HDPE liner can be found in Appendix G. The HDPE would be protected from site soils by the clay layer. The geotextile mat would consist of a 32oz/yd non-woven geotextile mat meeting specifications equal to or greater than the Ultra-Vera highly UV Stable Geotextile UV 1320 manufactured by Tenax Corporation. See Appendix G for specifications. The 32 oz/yd textile was specially chosen to protect the HDPE liner. The bottom one foot of the gravel protection layer, also used as the leachate collection system, has a maximum subrounded aggregate size of ¾" to a minimum aggregate retained on a #10 screen. This material would have permeability equal to or greater than 1 cm/sec. The upper foot of the gravel layer would be used as a protection layer. The protection layer would be constructed with a maximum subangular aggregate of 1 ¼" and the minimum aggregate retained on a #10 screen. The permeability of this material would be greater or equal to 1 cm/sec. The Owner may elect to use the same material specification as the leachate collection system or the designed protection layer aggregate specification listed above. Overlaying the 24" gravel leachate and protection layers would be a 24 oz/yd non-woven geotextile mat used to separate the leachate collection system and the waste. Specifications for this layer of geotextile would be similar to the previous layer.

4.5.3 Settlement

Settlement calculations were performed for the proposed cell design. Settlement calculations throughout the site ranged from 0-10 inches for the overburdened soil and 0-6 inches for bedrock strain. These calculations were based on a final cover slope of 4 horizontal to 1 vertical and excavation and removal of the top 10 feet of site soil.

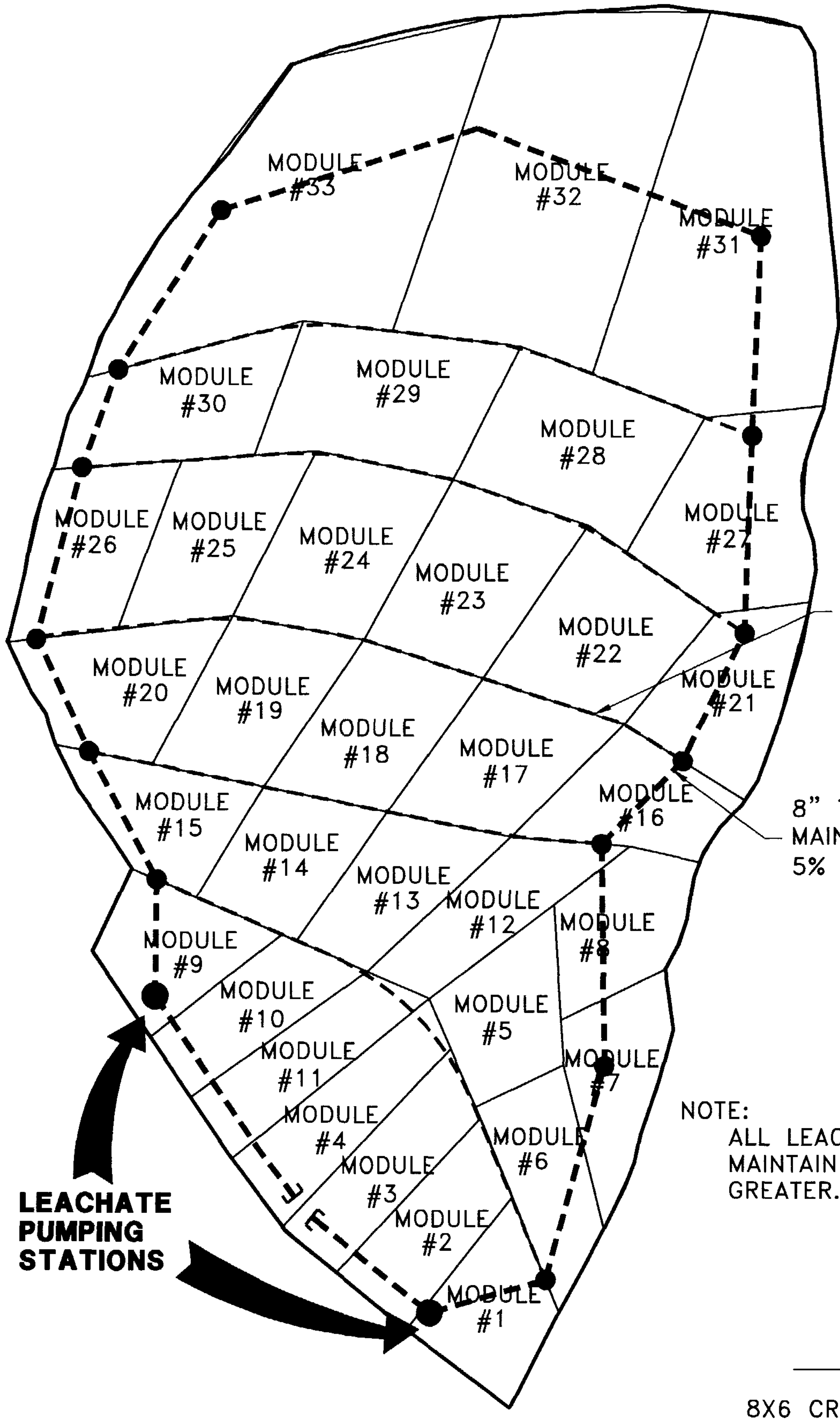
4.5.4 Leachate Collection System

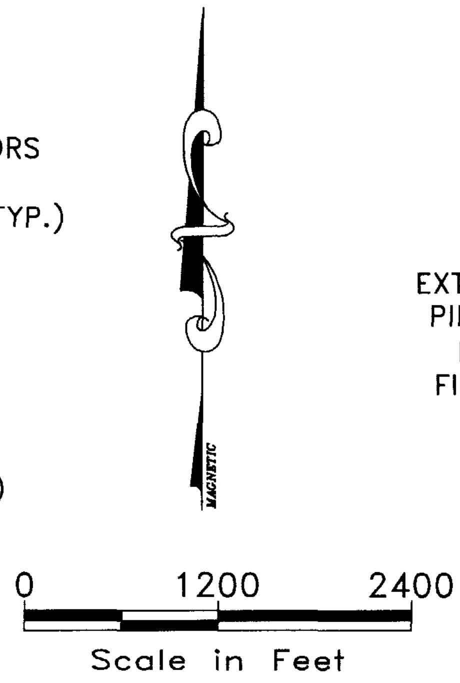
The proposed Class I Landfill would be equipped with a leachate monitoring and collection system as shown on Figure 4.3. The system is comprised of a network of drains which gravity flow to centrally located sumps positioned at the lowest points of the landfill cell. Risers would be placed along critical areas of the main leachate trunk line for monitoring and maintenance. The collection system would be constructed with perforated drainpipe encased within a 24" gravel layer overlain by a geotextile mat for separation between the MSW and leachate collection system. The collection system piping would be designed to handle the specific site loading conditions. See Appendix G for a letter from fiberglass piping manufacturer as to the ability of pipe to perform under high loadings. To help protect the collection system, the gravel protection layer would be thickened near the sumps. Leachate would be pumped on an as-needed basis to maintain a level of less than 1 foot of leachate over the liner system. Sump areas would be constructed as indicated on Figure 4.3. The removed leachate would either be use as a suppressant for fugitive dust and compaction water on areas of the landfill that are overlaid by an approved liner system or pumped to evaporation basins. Cleaning of the leachate collection system would be conducted on an as needed basis.

The collection system was designed by quantifying the amount of leachate generated for the entire 1000-acre disposal cell. Further information about the modeling will be presented in the site balance section of this chapter. Calculations for determination of collection system placement and output files are included in Appendix H.

4.5.5 Final Cover

The disposal cell was designed to eliminate infiltration through the cover to prevent



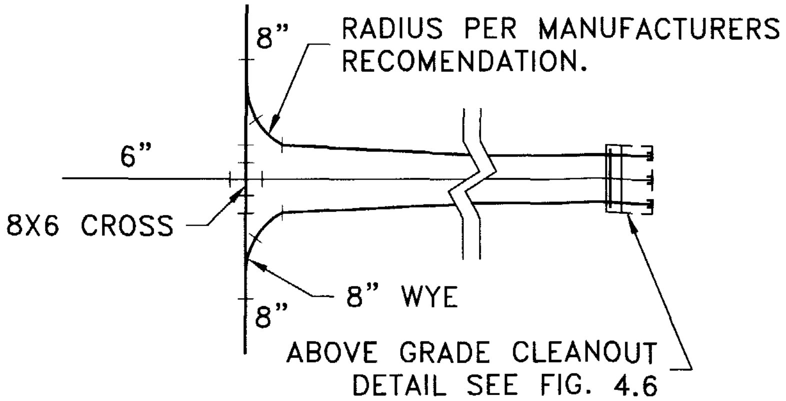


● = CLEANOUT/ INSPECTION RISER SEE PIPE CONNECTION DETAILS SHEET

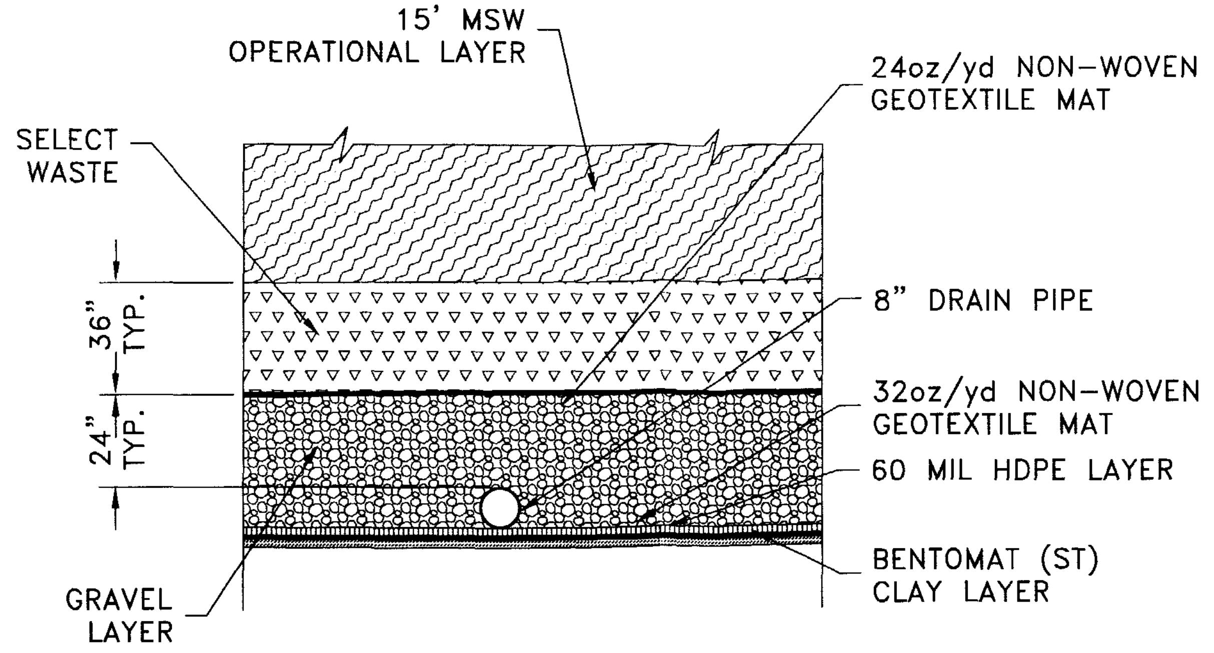
NOTE:
ALL LEACHATE PIPING TO MAINTAIN 5% SLOPE OR GREATER.

LEACHATE COLLECTION PLAN

SCALE: 1"=1200'



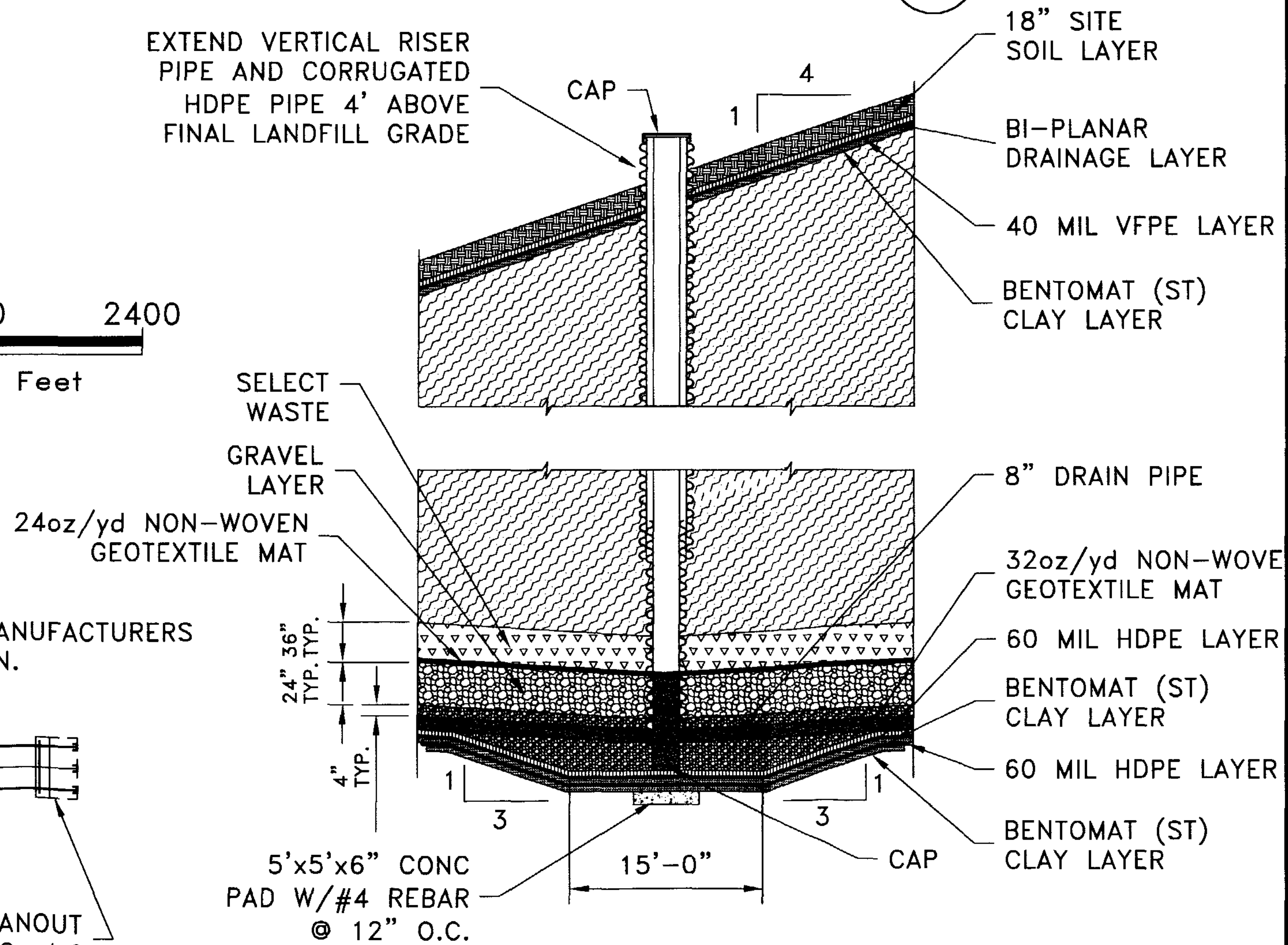
TYPICAL CLEANOUT PLAN



LEACHATE COLLECTION SYSTEM SECTION

N.T.S.

C / –



LEACHATE COLLECTION SUMP DETAIL

N.T.S.

E / –

0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

DESIGN:	CAH
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SCALE: HORZ.	AS SHOWN
VERT.	NONE
DATE:	JULY 2003

ENGINEERS SEAL

REVISIONS
NO.	DATE

PROMONTORY LANDFILL LLC
PROMONTORY LANDFILL FACILITY
PROMONTORY LANDFILL DESIGN
LEACHATE COLLECTION PLAN

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

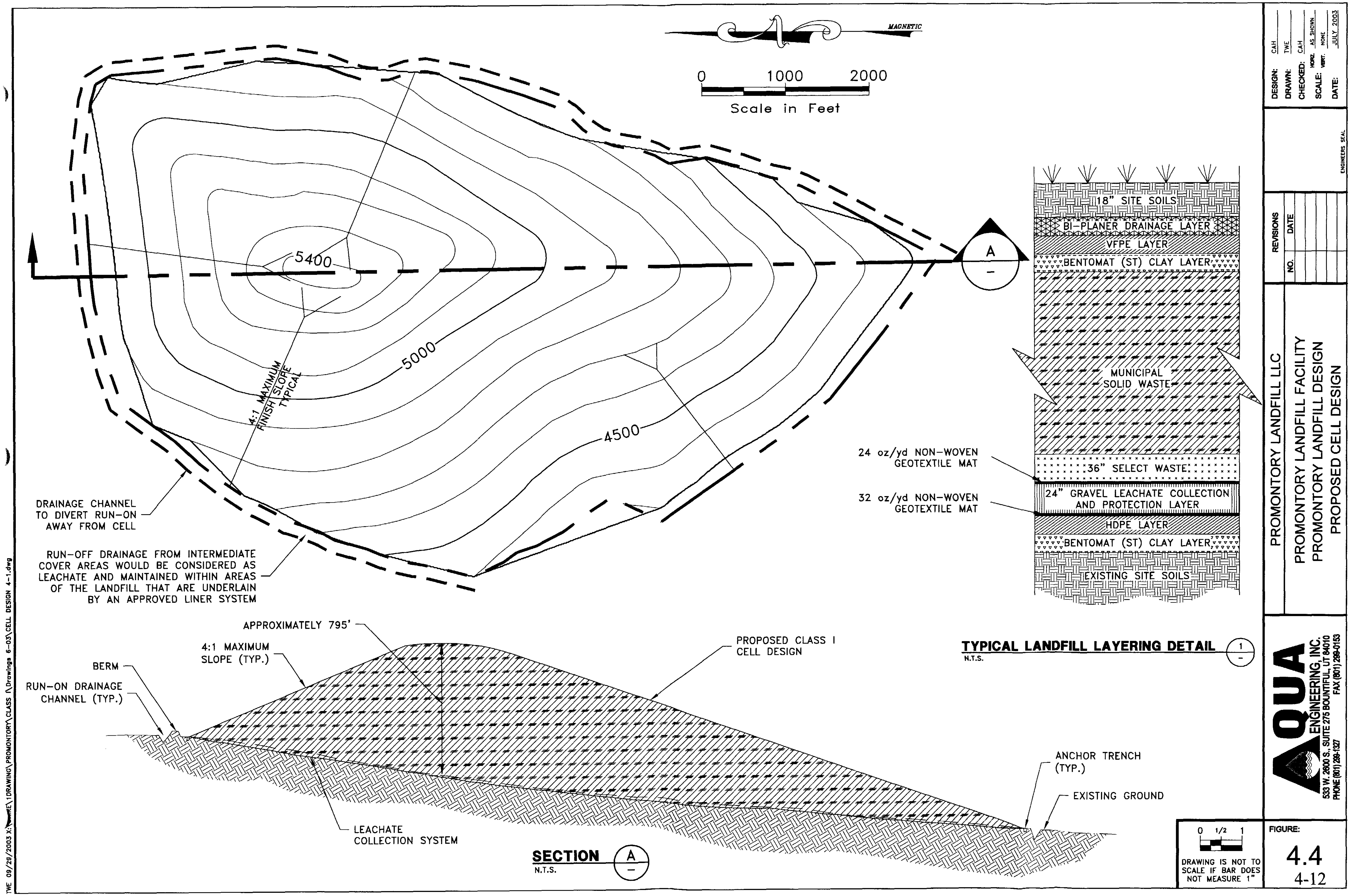
FIGURE: 4.3

TWE 09/29/2003 ...\DRAWING\PROMONTORY\CLASS I\Drawings 6-03\Leachate Collection.dwg the generation of leachate. This was accomplished by promoting drainage and evapotranspiration from the cover, and by preventing percolation of precipitation into the disposal cell. The proposed final cover would consist of the following layers (or equal); Bentomat (ST), 40 mil textured VFPE, Bi-planar Fabricap Geocomposite with 6 oz Geotextile bonded to both sides, and eighteen inches of site soils. See Appendix G for sample specifications. The final cover would be graded as shown in Figure 4.4. Materials for the final cover will be acquired by cell excavation or imported from nearby borrow areas. The waste surface would be prepared so as to be free of irregularities, protrusions, vegetation, excessive water, loose soil or abrupt changes in grade. The surface would not contain stones or other matter of such composition, shape, or size, which may be damaging to the geomembrane as specified by the manufacturer. The anchor trenches for the cover and liner would be constructed to the lines, widths, and depths recommended by the geomembrane manufacturer. The trench would be free of irregularities, protrusions, etc. to avoid damage to the membranes. Backfill operations would be conducted when the geosynthetic matter is at its most contracted state to prevent bridging. The fill material would be placed in a manor to prevent damaging the membrane and compacted to 85% max dry density per ASHTO T-99.

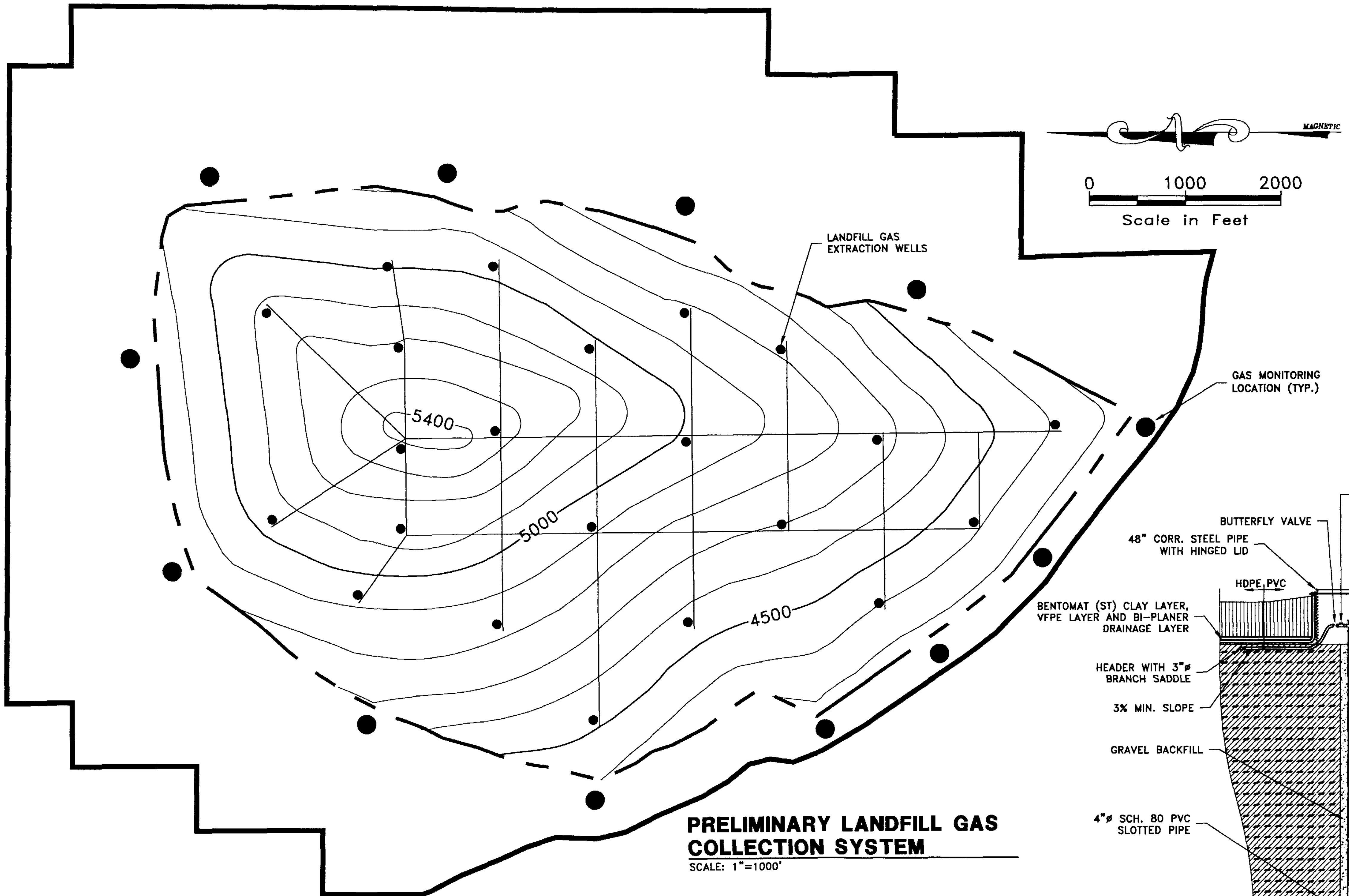
Drainage channels would be constructed around the cell as indicated by the drawings to help prevent erosion and divert any run-on and run-off in a controlled manner. Berms would be placed and used as needed.

4.5.6 Landfill Gas Collection System

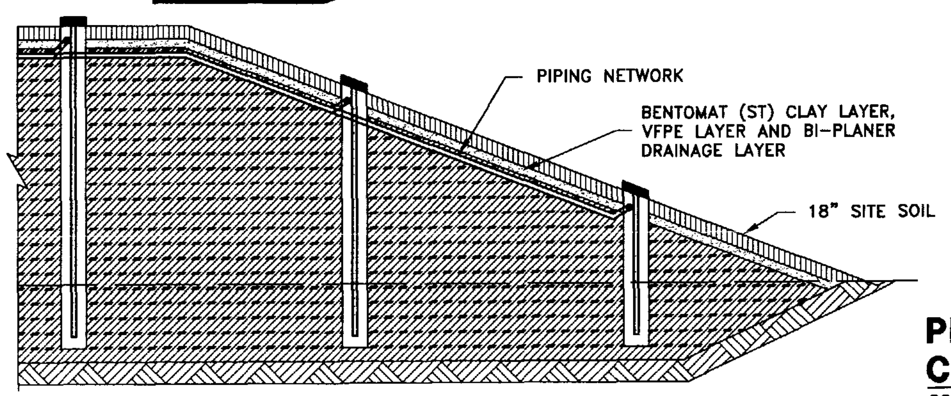
The preliminary landfill gas collection system (LGCS), shown on Figure 4.5, would be implemented to eliminate potential problems associated with landfill gas including subsurface lateral migration, odor, and release of methane. Gas Collection and management would need to be reviewed and approved by the Division of Air Quality prior to construction of the system.



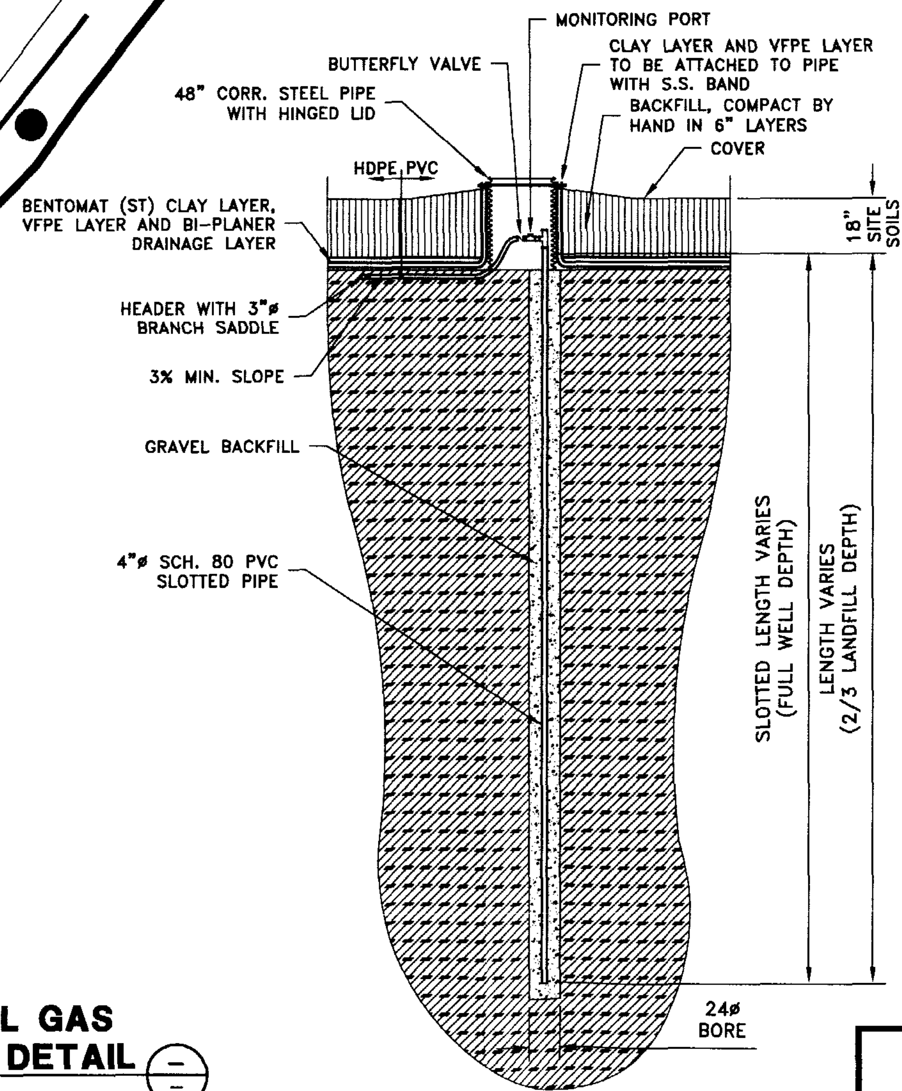
MAGNETIC
0 1000 2000
Scale in Feet
5400
5000
4500
4:1 MAXIMUM FINISH SLOPE TYPICAL
A
DRAINAGE CHANNEL TO DIVERT RUN-ON AWAY FROM CELL
RUN-OFF DRAINAGE FROM INTERMEDIATE COVER AREAS WOULD BE CONSIDERED AS LEACHATE AND MAINTAINED WITHIN AREAS OF THE LANDFILL THAT ARE UNDERLAIN BY AN APPROVED LINER SYSTEM
18" SITE SOILS
BI-PLANER DRAINAGE LAYER
VFPE LAYER
BENTOMAT (ST) CLAY LAYER
MUNICIPAL SOLID WASTE
24 oz/yd NON-WOVEN GEOTEXTILE MAT
36" SELECT WASTE
32 oz/yd NON-WOVEN GEOTEXTILE MAT
24" GRAVEL LEACHATE COLLECTION AND PROTECTION LAYER
HDPE LAYER
BENTOMAT (ST) CLAY LAYER
EXISTING SITE SOILS
TYPICAL LANDFILL LAYERING DETAIL
N.T.S.
1
APPROXIMATELY 795'
4:1 MAXIMUM SLOPE (TYP.)
BERM
RUN-ON DRAINAGE CHANNEL (TYP.)
PROPOSED CLASS I CELL DESIGN
ANCHOR TRENCH (TYP.)
EXISTING GROUND
LEACHATE COLLECTION SYSTEM
SECTION
N.T.S.
A
0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"
DESIGN: CAH
DRAWN: TWE
CHECKED: CAH
SCALE: HORZ. AS SHOWN VERT. NONE
DATE: JULY 2003
ENGINEERS SEAL
REVISIONS
NO.
DATE
PROMONTORY LANDFILL LLC
PROMONTORY LANDFILL FACILITY
PROMONTORY LANDFILL DESIGN
PROPOSED CELL DESIGN
AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327
FAX (801) 299-0153
FIGURE:
4.4



PRELIMINARY LANDFILL GAS COLLECTION SYSTEM
SCALE: 1"=1000'



PRELIMINARY LANDFILL GAS COLLECTION SYSTEM DETAIL
SCALE: NTS



0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

DESIGN: CAH
DRAWN: TWE
CHECKED: CAH
SCALE: HORZ. AS SHOWN VERT. NONE
DATE: JULY 2003

ENGINEERS SEAL

REVISIONS	
NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
PROMONTORY LANDFILL DESIGN
LANDFILL GAS COLLECTION SYSTEM

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE:
4.5

Landfill gases typically consist of approximately 50% methane and 50% carbon dioxide and were modeled as such. Landfill Gas Emissions Model version 2.1 (EPA) was used to model gas generation. The parameters used in the model were default parameters specified by the Environmental Protection Agency (EPA).

According to the Utah Department of Air Quality, this model typically overestimates gas production in this region when default arid climate parameters are used. This is evident in Table 4.1, which shows over a magnitude of difference in the emissions rate using the default EPA parameters versus parameters used in the Salt Lake Valley Solid Waste Management Facility Permit Application. Salt Lake Valley Solid Waste Management Facility's parameters were used because of the facilities close proximity and similar environmental setting. The output files using these default parameters are included in Appendix I.

TABLE 4.1
VALUES USED FOR LANDFILL GAS COLLECTION SYSTEM

Description	**Lo (m^3/Mg)**	**K (1/yr)**	**NMOC (ppmv)**	**NMOC Emissions Rate (Mg/yr)**
EPA Default	170	0.02*	4000	1.96E+04
Salt Lake Valley	169.9	0.02*	300	1.46E+03

* Value accounts for arid regions
NMOC: Nonmethane Organic Compounds
ppmv: Parts per million by volume
Lo: Generation Potential (amount of methane generated by a given amount of refuse)
K: Decay Rate (exponential rate of decomposition)

The landfill gas collection system was conservatively designed using the emissions rate generated for EPA default parameters. The active gas collection system would be put into service when NMOC emissions at the site were to exceed 50 Mg/yr (55 tons/yr) or concentrations of methane gas were to exceed the lower explosive limit at the property boundaries. This is estimated to take place between 8 to 9 years after operations start. Extraction wells and collection piping would be strategically placed for effective gas collection.

4.6 SITE WATER BALANCE

Hydrologic modeling of the Class 1 disposal cell was performed in order to assess the water balance for a closed case.

4.6.1 HELP Modeling Parameters

The hydrology of the disposal cell was predicted using the computer model Hydrologic Evaluation of Landfill Performance (HELP), Version 3.07 for a open and closed cell case. Modeling of the cell was performed to design the leachate collection system, evaporation basin, and to determine the infiltration through the final cover.

HELP calculates the water balance for the proposed cell based on cell design and climatic conditions. Cell design consists of soil and waste layer thickness, hydraulic conductivity of each layer, percent of total area where run-off could occur, and other characteristics of the proposed cell design.

Based on the 30-year average daily temperature, precipitation, and monthly solar radiation, HELP calculates the water balance for the site that includes evapotranspiration, run-off, percolation, and change in water storage of the subsurface soils. The average annual precipitation for the period of record is 13.36 inches of which 12.97 inches are consumed through evapotranspiration.
The climatic data used was taken from the weather station at Bear River Migration Bird Refuge located approximately 26 miles northeast of the proposed landfill facility. A comparison was made for the data from a period between 1947 and 1984 and the average monthly data. By making a comparison between the yearly data and average data, a year was chosen to represent the average year. The year 1975 was used for precipitation and 1971 was used for temperature. The average recorded

precipitation for the site is 12.65 inches and the model used 13.36 inches. The average recorded site temperature is 50.15 °F and was modeled with 49.86 °F.

Open Cell Case for the Entire Site:
The assumed profile for the open cell case consisted of 19 layers. These layers included a total of nine 12 inches layers of site soils simulating daily cover (1.2 E-4 cm/sec), a total of nine MSW (1.0 E-3 cm/sec) layers of a thickness of 15 feet, and a single 24 inch layer of gravel for the leachate collection and protection layer (1 cm/sec). The evaporative zone was assumed to be 12 inches and the model ran for thirty years.

The following assumptions and data were also used in the model. The assumptions are considered conservative for the application of the model. Table 4.2 lists the soil values that were used in the analysis.

- Evaporative zone depth = 12 inches
- SCS runoff curve number = 83 (poor condition open space between Group B and C, over the life expectancy of the cell, it has naturally revegetated to 50% grass cover)

TABLE 4.2
SOIL VALUES USED FOR THE OPEN CELL CASE

Layer	Thickness (inches)	Zone Description	Total Porosity	Field Capacity	Wilting Point	Saturated Hydraulic Conductivity (cm/sec)
1	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
2	180	MSW	0.671	0.292	0.077	1.0 E-3
3	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
4	180	MSW	0.671	0.292	0.077	1.0 E-3
5	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
6	180	MSW	0.671	0.292	0.077	1.0 E-3
7	12	Daily Cover	0.398	0.244	0.136	1.0 E-5

8	180	MSW	0.671	0.292	0.077	1.0 E-3
9	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
10	180	MSW	0.671	0.292	0.077	1.0 E-3
11	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
12	180	MSW	0.671	0.292	0.077	1.0 E-3
13	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
14	180	MSW	0.671	0.292	0.077	1.0 E-3
15	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
16	180	MSW	0.671	0.292	0.077	1.0 E-3
17	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
18	180	MSW	0.671	0.292	0.077	1.0 E-3
19	24	Protection Layer	0.397	0.032	0.013	1

Closed Cell Case for the Entire Site:

The assumed profile for the closed cell case consisted of 18 inches of site soil (1.0 E-5 cm/sec), overlaying 0.23 inches of fibricap (33 cm/sec), overlaying 0.23 inches of a textured VFPE (4.0 E-13 cm/sec), and overlaying 0.23 inches of Bentomat (ST) (3.0 E-9 cm/sec). The evaporative zone was assumed to be 18 inches and modeled for a period of thirty years.

The following assumptions and data were also used in the model. The assumptions are considered conservative for the application. Table 4.3 lists the soil values that were used in the analysis.

- Evaporative zone depth = 18 inches
- SCS runoff curve number = 79 (natural desert landscape Group C, cell has been fully re-vegetated)

TABLE 4.3
SOIL VALUES USED FOR THE CLOSED CELL CASE

Layer	Thickness (inches)	Zone Description	Total Porosity	Field Capacity	Wilting Point	Saturated Hydraulic Conductivity (cm/sec)
1	18	Evaporation	0.501	0.284	0.135	1.0 E-5
2	0.23	Drainage	0.85	0.01	0.005	33
3	0.23	VLDPE	0.0	0.0	0.0	4.0 E-13
4	0.23	Bentomat (ST) Clay Layer	0.75	0.747	0.4	3.0 E-9

Note: The VLDPE was modeled assuming a pinhole density of 1-pinhole/acre and installation defects of 3-pinholes/acre. The quality of installation was modeled as good.

Leachate Collection System and Evaporation Basins:

The profile used to estimate leachate generation consisted of 12 inches of daily cover (1.0 E-5 cm/sec), overlaying 15 feet of MSW (1.0 E-3 cm/sec), and overlaying a 24-inch protection layer (1 cm/sec). The evaporative zone was assumed to be 12 inches and model ran for thirty years.

The following assumptions and data were also used in the model. The assumptions are considered conservative for the application of the model. Table 4.4 lists the soil values that were used in the analysis.

- Evaporative zone depth = 12 inches
- SCS runoff curve number = 92 (poor condition barren surface, no vegetation on daily cover)

TABLE 4.4
SOIL VALUES USED SIZING THE EVAPORATION BASIN

Layer	Thickness (inches)	Zone Description	Total Porosity	Field Capacity	Wilting Point	Saturated Hydraulic Conductivity (cm/sec)
1	12	Daily Cover	0.398	0.244	0.136	1.0 E-5
2	180	MSW	0.6710	0.292	0.077	1.0 E-3
3	24	Protection Layer	0.397	0.032	0.013	1

4.6.2 HELP Modeling Results

Open Cell Case for the Entire Site:

Table 4.5 summarizes the results of the cover analysis. The modeling results indicate that no leachate would reach the leachate collection system. This can be attributed to the site's low precipitation, high evaporation, and relatively deep fills.

TABLE 4.5
RESULTS FOR THE OPEN CELL CASE

Description	Results
Precipitation	13.36 inches/year
Runoff	0.027 inches/year
Evapotranspiration	13.24 inches/year
Percolation/Leakage	0.08 inches/year
Peak Percolation/Leakage	0.0008 inches/day

To facilitate a more detailed analysis, printouts of the HELP model Outputs results are also included in Appendix H.

Closed Cell Case for the Entire Site:

Table 4.6 summarizes the results of closed cell case used to evaluate the cover design. The model only considered the cover design.

TABLE 4.6
RESULTS FOR THE CLOSED CELL CASE

Description	Results
Precipitation	13.36 inches
Runoff	1.314 inches/year
Evapotranspiration	12.022 inches/year
Lateral Drainage	0.00786 inches/year
Percolation/Leakage	0 inches/year

The results indicate the total percolation through the proposed 1000-acre cover using 4 pinholes per acre is 1.1 gallons per year. To facilitate a more detailed analysis, printouts of the HELP model Outputs results are also included in Attachment H.

<u>Leachate Collection System and Evaporation Basins:</u>

Table 4.7 summarizes the average monthly values of leachate generated on a per month basis.

TABLE 4.7
MONTHLY LEACHATE GENERATION

Month	Results
January	0.01 inches
February	0.01 inches
March	0.01 inches
April	0.01 inches
May	0.00 inches
June	0.00 inches
July	0.02 inches
August	0.02 inches
September	0.02 inches
October	0.02 inches
November	0.01 inches
December	0.01 inches

Using 0.02 inches from August's results and a twenty-acre collection area, the gravel layer would need to flow 0.24 gpm for the entire 20 acres or 2.8 E-7 gpm per square foot. Using the proposed ¾" aggregate mix design for the bottom 1 foot of the gravel layer, with a permeability of 1 cm/sec, the flow rate using Darcy's Law is 0.74 gpm per square foot. The maximum subrounded aggregate of ¾" allowing for a factor of safety of 3 for geomembrane puncture. Calculations are provided in Appendix H.

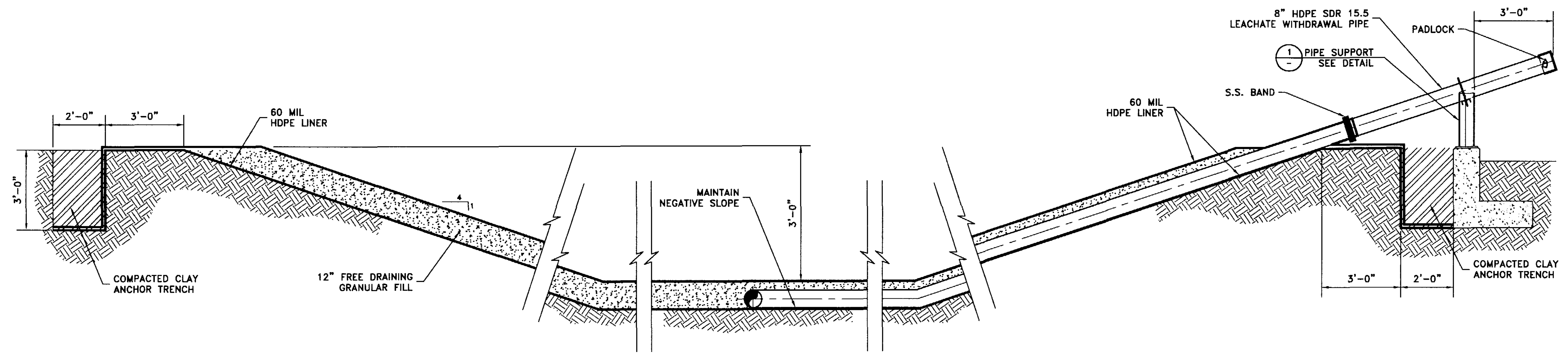
The monthly leachate calculated from module 1 was used in a mass balance calculation to determine the size requirements for a leachate evaporation basin. The mass balance accounted for leachate generation as shown in Table 4.7, precipitation, and evaporation from a free water surface. The first evaporation basin would be sized greater than 900 ft^2 with additional evaporation basins being constructed as required to accommodate future module development. Detailed calculations are included in Appendix H. Figure 4.6 and 4.7 show details for the Evaporation Basins.

4.7 RUN-ON AND RUN-OFF CONTROLS

Run-on and run-off storm water would be controlled during both the open and closed phases of the disposal cells. Drainage swales would be used to divert water around the modules to the existing on-site washes. Final cover run-off would be routed to the perimeter drainage swales and discharged to the existing washes on the property in such a manner to minimize erosion. Run-off along the access roads would be controlled with lowered profile waterways. If required, culverts would be strategically placed along the access road.

4.7.1 Run-on/Run-off Analysis

All storm water that comes in contact with waste must remain within the boundaries of the landfill liner system and be managed as leachate. All storm water that does not come in contact with waste is not considered leachate and would not be allowed to



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ENGINEERS SEAL

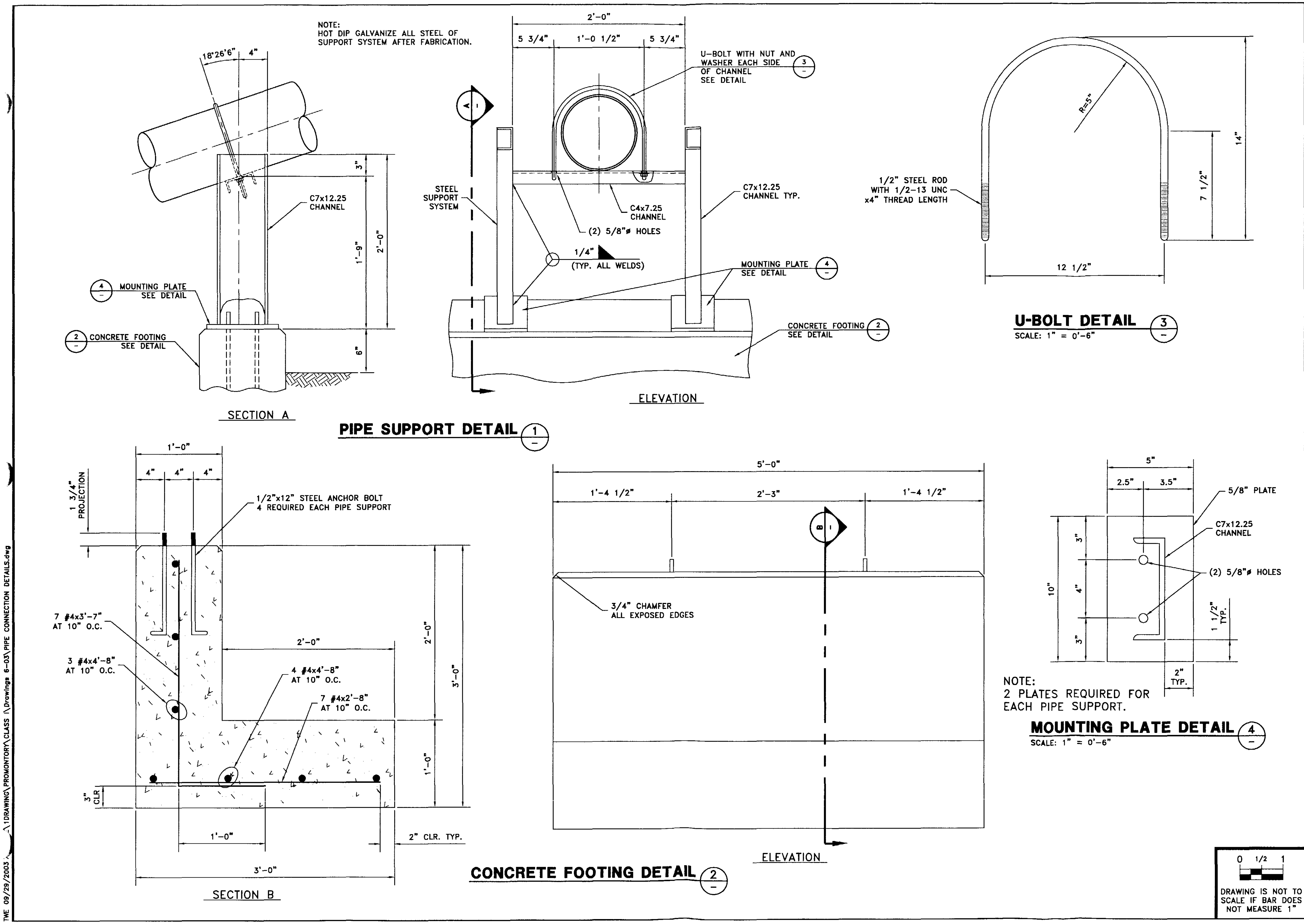
REVISIONS	
NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
EVAPORATION BASIN DETAIL

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE:
4.6



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PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
PIPE CONNECTION DETAIL

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE:
4.7

enter the landfill. Leachate collection system piping would be used to collect any run-on to the cell from the drainage swales to the lined cell.

For permitting purposes, a drainage analysis was completed for the entire 1000-acre landfill cell. All areas within the proposed facility that do not contribute run-on to the landfill cell were excluded. The area contributing run-on flow to the 1000-acre landfill site is shown on Figure 4.8 and Figure 4.9. The entire drainage area was evaluated in both pre-developed and developed conditions. Figure 4.8 shows the pre-developed site drainage and Figure 4.9 shows the developed site drainage.

The quantity of flow expected for pre-developed and developed conditions was determined by using precipitation for the 25-year, 24-hour storm event of 2.2 inches (NOAA Atlas 2 published in 1973). The Runoff Curve Number of 67 was obtained based on soil hydrologic group "B" (sandy loam) and poor conditioned sagebrush with grass (BOR, 1977). The peak flow generated was determined by applying the U.S Soil Conservation Service Technical Release Number 55 (SCS TR-55) method.

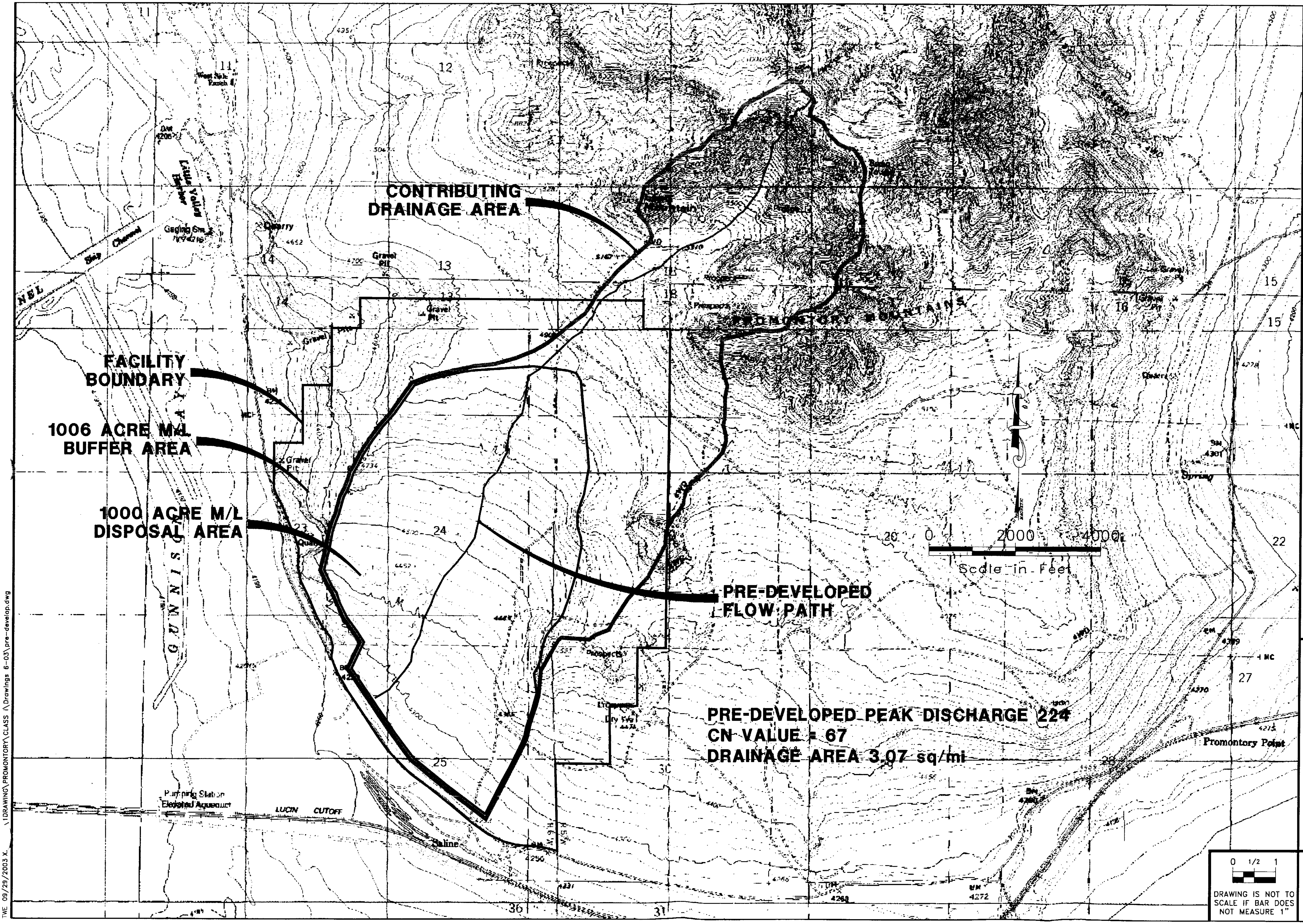
Details of the input parameters and the model output are included in Appendix J. Table 4.8 shows the peak discharge generated from both pre-developed and developed conditions.

TABLE 4.8

STORMWATER PEAK DISCHARGE

Condition	**Peak Discharge (cfs)**
Pre-developed	224
Developed	210

As the cells are developed, the site drainage paths are lengthened reducing the peak discharge rate from its original condition.



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PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
PROMONTORY LANDFILL DESIGN
PRE-DEVELOPED SITE DRAINAGE

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE: 4.8

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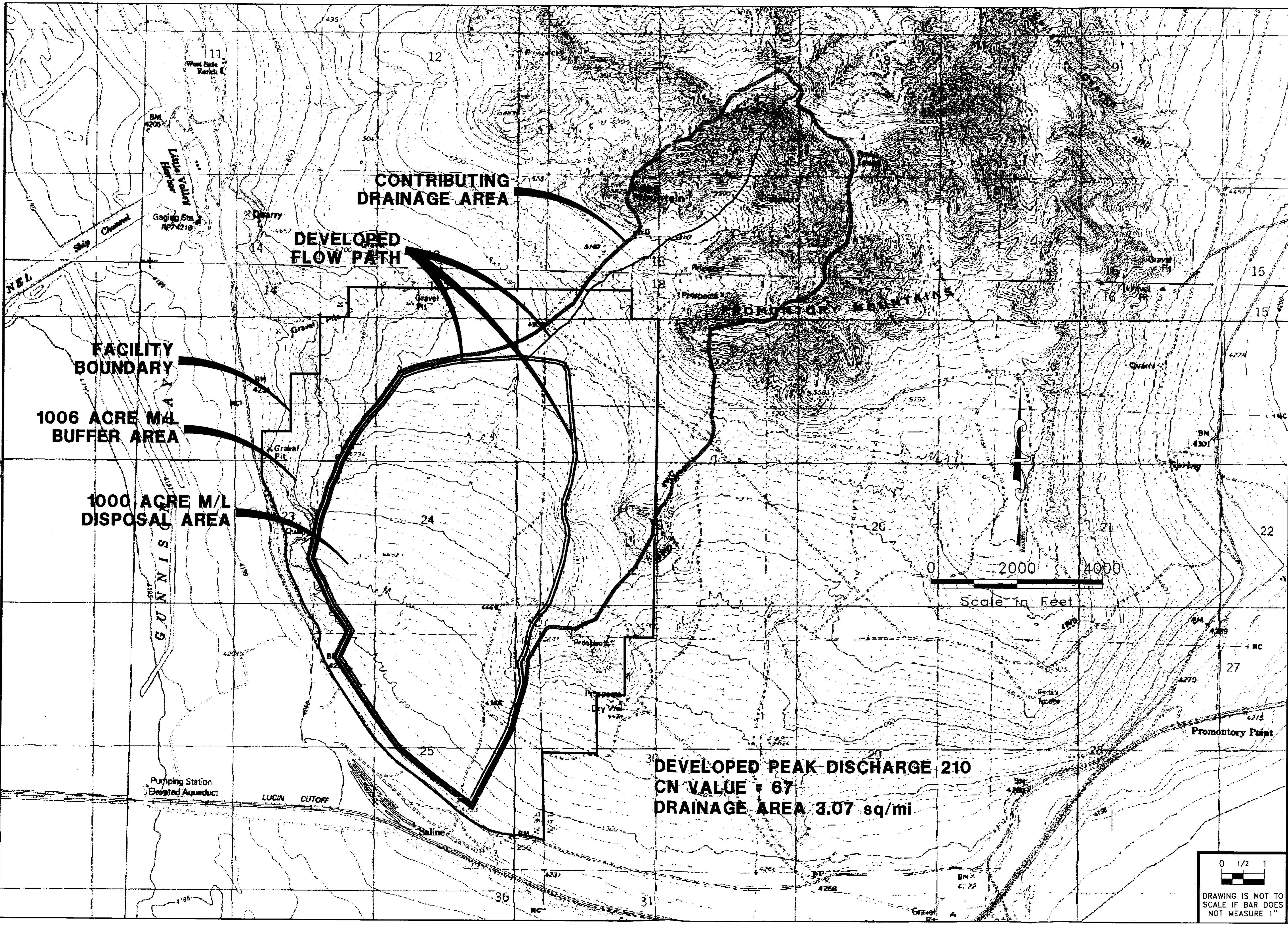

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DATE: JULY 2003

ENGINEERS SEAL

REVISIONS

NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
PROMONTORY LANDFILL DESIGN
DEVELOPED SITE DRAINAGE

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE: 4.9

TWE 09/29/2003 X:\1DRAWING\PROMONTORY\CLASS 1\Drawings 6-03\developed.dwg

4.7.2 Drainage Swales

If needed all future manmade swales would be constructed to include drop structures to maintain a channel velocity less than 2.5 to 3.5 (fps). These swales would be used to divert water around and away from the cell to reduce erosion potential.

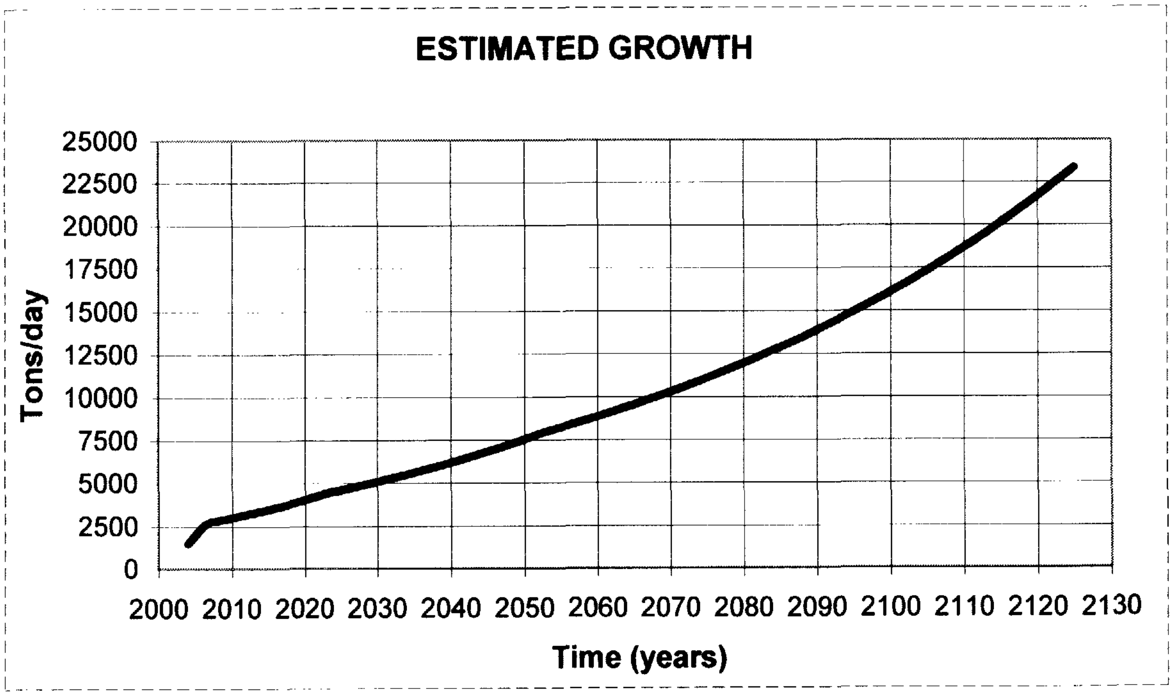
4.7.3 Culverts

No culverts were identified during site investigations.

4.8 LIFE EXPECTANCY

Every effort has been made to utilize assumptions and parameters in calculating the life expectancy of the landfill that are conservative. The assumptions and parameters used are listed below. Based on these, the Class I Landfill would be designed to meet the solid waste management requirements for a period of one hundred twenty-one years. The spreadsheet used for this determination is located in Appendix K. A graph of the expected growth pattern of the landfill is shown below. The following assumptions were used in the analysis:

- A total of 1000 usable acres for Class I disposal.
- The unit weight of the municipal solid wastes is 1200 lb/yd3.
- 1500 tons per day for the first year of operation.
- 2000 tons per day for the second year of operation.
- 2500 tons per day for the third year of operation.
- 2750 tons per day for the fourth year of operation.
- 3% annual growth rate after the fourth year of operation.
- 2% annual growth rate after the twentieth year of operation.
- 1.5% annual growth rate after the fiftieth year of operation.
- A 10% reduction of volume to account for intermediate cover.



4.9 PERIMETER FENCING

Perimeter fencing would be provided for both security and retention of wind blown waste. The perimeter fencing would enclose the facility's operational areas and is discussed further in Appendix L.

4.10 WIND EROSION

The Promontory Landfill site is located on a peninsula in the Great Salt Lake. Thus, the site is subject to changing prevailing winds, but the predominant winds are from the southwest. Wind erosion at this location would primarily come from dust from earthwork operations, traffic, and fugitive waste. Each of these issues has been addressed to minimize man made causes of wind erosion.

Blowing dust and dirt would be minimized by prevention and response to areas where the problem occurs. Dust would be mitigated on an as needed basis using dust suppressants and road surface treatments. Leachate may only be used as a suppressant on areas of the landfill that are overlain by an approved liner. Stockpiles of dirt would also need to be monitored. Disturbances of natural vegetation at the site would be minimized the extent possible in non-operational areas.

Fugitive waste would be controlled by keeping incoming loads covered, an indoor transfer facility, use of temporary and permanent fencing in critical areas to retain waste, covered loads traveling to the tipping face, and periodic cleanup of fugitive waste around the site. All shipments of waste into the facility would be covered. Perimeter fencing would be designed to help contain fugitive waste on site. Temporary fencing would be placed in locations of concern such as the working face. Clean up of waste spills and captured waste would reduce the potential for off-site fugitive waste. The site and surrounding area would be inspected regularly to determine effectiveness of the litter fencing and clean up scheduling. A fugitive waste plan is included in Appendix L.

CHAPTER V
PLAN OF OPERATION

5.1 PURPOSE

The purpose of the Plan of Operation (OP) is to provide a written description of the daily operation of the proposed Class I Landfill. The proposed action will incorporate a Class I Landfill at the proposed Promontory Landfill Facility.

A landfill is a dynamic system that undergoes continual development. Changes may occur in quantities of disposed materials, topography of the landfill, demographics of the service area, and administrative or regulatory requirements. These changes would be accomplished to conserve landfill space and protect human health and the environment. The intent of this OP is to provide an accurate description of the daily operations and procedures while allowing for modifications, which may be required to compensate for operational changes.

5.2 OPERATIONAL PROCEDURES

5.2.1 Excavation and Construction of the Cells

Excavation of the cells would begin with grubbing and removal of shrubs, grass, and other vegetation. The surface soil is stripped to a minimum depth of 6 inches and stockpiled. The cell would be excavated to the maximum extent possible maintaining a minimum slope of 5% and maintaining at least one foot of site soils over any exposed bedrock. The surface would not contain stones or other matter of such composition, shape, or size which may be damaging to the liner system.

The refuse would be trucked to the tipping face and dumped and then compacted by a landfill compactor prior to placement of additional refuse. The unloading of refuse would be restricted to one area of the working face to limit the amount of refuse exposed.

The final cover for the Class I cell would be designed using Bentomat (ST), 40 mil VFPE, bi-planar drainage net and 18 inches of site soils. The cover would then be seeded and lightly compacted to support vegetation and reduce erosion.

5.2.2 Equipment

The Owner would maintain the necessary equipment to off-load, spread and compact waste, control dust, and perform other facility operations. The following Table 5.1 is a preliminary list of the possible equipment that may be used on the site.

TABLE 5.1
PROMONTORY LANDFILL EQUIPMENT LIST

Equipment Description	**# of Pieces**	**Purpose**
Front-end Loader, Cat 980 size	1	Handle MSW at unloading facility
Articulated off-road truck, Cat D400E size	2	Haul solid waste from rail siding to cells
Self-loading scraper, Cat 623 size	2	Excavate for cells; haul cover material
Track mounted dozer, Cat D8 size	1	Place solid waste in cells
Track mounted dozer, Cat D9 size	1	Cell and cover material excavation
Landfill compactor, Cat 836G size	1-2	Compact solid waste
Motorgrader, Cat 140G size	1	Construct/maintain haul roads & cells
Front-end loader, Cat 966IT size	1	Handle bail garbage; road/berm construction
Truck mounted 4000 gallon water tank	1	Dust control
Tractor mounted 10,000 gallon water wagon	1	Dust control
Super sucker vacuum truck	1	Clean rail cars
Steam boiler	1	Heat water to clean railcars
Railroad locomotive	1	Move railcars

5.3 ON-SITE SOLID WASTE HANDLING PROCEDURES

Daily operation of the Class I Landfill and related facilities would be under the direction of the Landfill Manager. In the event of the Landfill Manager's absence, a Senior Operator would be the designee in charge of the landfill.

At the beginning of each working day, the Landfill Manager would be responsible for informing operators of any special off-loading conditions, for either trucks or the railroad, and where to direct solid waste for disposal. The Landfill Manager or Senior Operator would be responsible for directing each transport vehicle to the proper location for disposal of its waste. This could alternatively be accomplished through the placement of directional signs. The Landfill Manager or the Senior Operator would be at the landfill during all operating hours.

The Owner probably would elect to construct scales for the Class I Landfill. The scale operator would perform load counts on a daily basis and make a record of the load source.

Incoming refuse directed toward the landfill would be deposited at the working face under direction the Landfill Manager or Senior Operator.

5.4 MONITORING SCHEDULE

A Monitoring Plan has been developed to help in the prevention of problems that may preventable through careful monitoring and inspection. The schedule provides details on groundwater monitoring, leachate monitoring, and landfill gas monitoring. A copy of the Monitoring Plan is included in Appendix M.

5.5 EMERGENCY OPERATIONS PLAN

The Emergency Operations Plan for the proposed facility is included in Appendix N. The Emergency Operations Plan provides protocols for landfill employees in cases of emergency.

Should an emergency happen, the DEQ may elect to waive daily cover requirements on C & D Materials.

5.6 CONTINGENCY PLAN

The Contingency Plan is designed to minimize hazards to human health or the environment from any unplanned sudden or non-sudden discharge to air, soil, surface, or groundwater. The provisions of this plan would be carried out immediately upon an emergency situation or release, which could threaten human health or the environment. Emergency evacuation of the site could be necessary given the nature of the waste materials stored and processed at the site. Incidents at the landfill could be caused by fire, explosion, or toxic vapor generation.

5.6.1 Fire or Explosion

The primary means of fire control in the proposed Class I Landfill would be to isolate hot or burning solid waste. In the event that a fire were to erupt during operating hours, the burning material would be separated from the other materials and doused with water or controlled with fire suppression equipment. This action would be supported, when necessary, by the mobilization of additional equipment owned and operated by the Owner or surrounding counties.

5.6.2 Explosive Gas Release

Methane gas release would be detected using a methane detection meter capable of measuring methane levels below the 25% Lower Explosion Limit. Gas monitoring would be conducted around the disposal area and in any of the facility structures. Upon detection of explosive gases equal to or above the lower explosion limit, the Owner or Operator would take the following steps:

1. Immediately upon detection, steps would be taken to protect human health. These steps would include evacuation of surrounding area, shutdown of any electrical or

mechanical devices that could cause ignition, and determination of the cause of explosive gas. The area would remain closed until corrective actions were taken.

2. Within 24 hours the Executive Secretary would be notified.
3. Within seven days of detection, the explosive gas levels would be recorded in the operating record along with a description of the steps taken to protect human health.
4. Within 60 days of detection, a remediation plan that had been approved by the Executive Secretary would be implemented and a copy of the plan placed in the operating record. Upon implementation, the Executive Secretary would be notified.

5.6.3 Failure of Drainage Containment System

If the containment system were to fail, the following actions would be taken:

1. Construct berms and ditches to divert water around the containment failure area using site soils or readily available materials.

2. Analyze and evaluate the extent of damage to the containment system.

3. Identify the mechanism of failure.

4. If warranted call a qualified professional to discuss possible solutions.

5. Develop and implement corrective actions.

5.7 ALTERNATIVE WASTE HANDLING AND DISPOSAL PLAN

In the event of a major equipment failure, solid waste would be loaded and shipped to an alternative waste disposal facility such as Box Elder County, Elko County, or other available landfills in the area. A contract will be negotiated for an alternative disposal location prior to the facility operating.

5.8 PROCEDURES FOR CONTROLLING DISEASE VECTORS

The use of daily cover and the exclusion of specific types of solid waste are necessary to control vectors and the subsequent spread of disease. Special waste such as infectious waste, liquid waste and tires, which may directly carry disease or lead to the propagation of disease vectors, would be immediately covered at the working face. Landfill personnel to the extent possible would inspect the site for signs and indications of disease vectors. If observations were made the Landfill Manager would be contacted immediately. If disease vectors were to become a problem, pest control specialists would be contacted to reduce the spread of disease.

5.9 PROCEDURES FOR EXCLUDING THE RECEIPT OF HAZARDOUS WASTE

A "Prohibited Waste" control program designed to detect and deter attempts to dispose of hazardous and other unacceptable waste would be implemented at the proposed Promontory Landfill Facility. The program is designed to protect the health and safety of employees, customers, and the general public, as well as protect against contamination of the environment. The Landfill Manager would be in charge of hazardous waste activities.

The waste disposed at the proposed landfill would be visually inspected prior to final placement. The waste would be inspected at off-site transfer stations and on-site. Further information about each of these inspection locations are listed below:

- The proposed landfill only accepts waste from any transfer stations that have a waste inspection plan approved by the Executive Secretary. Operators at the transfer stations would visually inspect waste for hazardous materials before loading for transit.

- On-site inspection would be conducted at the working face. Landfill operators will be trained in the recognition of prohibited waste. A random testing program would be conducted of all waste that has not already been inspected at transfer stations. These inspections would be conducted on one percent of all loads not obtained from transfer stations with a waste inspection plan approved by the Executive Secretary. A sample form for these inspections has been included in Appendix O. All waste would be visually inspected, as it is being placed, spread and compacted in the cell. Upon finding unacceptable waste, it would be isolated and the Landfill Manager would be notified.

5.10 GENERAL TRAINING AND SAFETY PLAN

Each employee at the landfill facility would be trained to have a working knowledge of the maintenance and operational techniques necessary to operate and maintain the landfill facility in a manner to preserve human health, safety, and the environment. Training would be accomplished through on-the-job training (OJT) and classroom training sessions. The Landfill Manager, or a designated professional trainer, would be in charge of directing the training programs. Initial training would be completed within three months of employment followed by an annual review of basic waste management skills.

5.10.1 Training Schedule

The Landfill Manager would be required to pass the SWANA Manager of Landfill Operations (MOLO) course or equivalent. In addition, operators are required to take one or both of the SWANA training courses: Landfill Operator Training, and Waste Screening or equivalent. Continuing education efforts include the following:

Introductory Training

Synopsis of solid waste regulations, record keeping, and transporter requirements.

- Requirement: All Personnel
- Method: OJT
- Review: Quarterly

Policies and Procedures

Security, inspections and emergency response.

- Requirement: All Personnel
- Method: Lecture/Video Course, OJT
- Review: Quarterly

Safety

Personal protection, hazardous waste recognition, hazardous material handling, emergency response, and first aid.

- Requirement: All Personnel
- Method: Classroom/Video Course
- Review: Annual

A Safety Training meeting is held once a week taking a minimum of 15 minutes. Training documents would be kept with the Plan of Operation for a rolling five year period.

5.11 RECORD KEEPING AND REPORTING

The Landfill Manager would maintain the following operating records for the landfill:

- Records of maintenance

- Records of training and notification procedures
- Records of groundwater monitoring
- Records of landfill gas monitoring
- Records of weights and volume, number of trucks and railcars
- Deviations from the plan of operation
- Records of placement or recirculation of leachate
- Records of any gas condensate
- Prepare an annual report and place the report in the facility's operating record.

Sample forms for maintenance and gas monitoring are provided in Appendix O.

CHAPTER VI

CLOSURE AND POST–CLOSURE PLANS

6.1 PURPOSE

Closure activities would be implemented as each module within the disposal cell is completed. These closure activities would minimize the need for further maintenance, and minimize or eliminate the threat to human health and the environment from post-closure escape of solid waste constituents, leachate, contaminated run-off or waste decomposition products to the ground, ground water, surface water, or the atmosphere. A Monitoring Plan has been developed to prevent problems through careful monitoring and inspection. The plan provides details on groundwater monitoring, leachate monitoring, and landfill gas and is included in Appendix M.

6.2 FINAL COVER AND GRADING

The final cover would commence no later than 30 days after the final volume of waste was received in each module and would be completed within 180 days after the beginning of the closure activities. The proposed final cover would consist of the following layers (or equal); Bentomat (ST), 40 mil textured VFPE, Fabricap Geocomposite with 6 oz Geotextile bonded to both sides, and eighteen inches of site soils.

6.2.1 Revegetation

Revegetating the cover would consist of using an appropriate seed mix. The cover would be prepared to a clean, firm, and consistent seedbed. The seeds would be drilled ½ to ¼ inch deep or broadcasted in areas where drilling was found to be impractical.

6.3 FINAL INSPECTION

The Owner or Operator would notify the Executive Secretary of the Solid and Hazardous Waste Control Board (hereafter called Executive Secretary) of the intent to implement the closure plan 60 days prior to the projected final receipt of waste. The Owner or Operator would commence implementation of the closure plan within 30 days of final volume of waste and the cover would be completed within 180 days. The Owner or Operator then would have 90 days to submit the following items to the Executive Secretary: Closure plan sheets signed by a professional engineer registered in the State of Utah and a certificate from the engineer. The certificate would require a final inspection performed by the engineer to verify that the landfill was in compliance with all closure requirements as outlined in the permit and closure plans. Inspection would include cell cover design, run-on and run-off control, proper final grading to promote run-off, and restriction of access to the site by fencing. No later than 60 days after certification of closure, submit plats and a statement of fact concerning the location of any disposal site would be given to the county recorder to be recorded as part of the record of title. Proof of record of title then would be submitted to the Executive Secretary.

6.4 OPINION OF PROBABLE COSTS FOR CLOSURE

The opinion of probable costs for the final closure of the Class I Landfill has been prepared to comply with the Financial Assurance requirements and is presented in Table 6.1. The unit costs values were developed for a 20-acre parcel, using third party construction costs. The Owner may elect to stockpile cover materials in exchange for closure funds and would inventory stockpiled materials for each annual report.

TABLE 6.1
OPINION OF PROBABLE COSTS FOR CLOSURE

Task	Quantity	Units	Unit Cost	Task Cost
CLOSURE				
Mitigate, Fill, and Grade	20	Acre	$2,000	$40,000
Furnish and Install Benotmat ST	871,205	SF	$0.50	$435,603
Furnish and Install 40 mil VFPE	871,205	SF	$0.35	$304,922
Furnish and Install Fabricap Geocomposite	871,205	SF	$0.55	$479,163
Move & Place Site Soils (18")	48,400	CY	$5.00	$242,000
Final Grading	20	AC	$1,500	$30,000
Revegetation	20	AC	$1,300	$26,000
Survey & Engineer Certification	1	LS	$7,000	$7,000
Subtotal				**$ 1,564,688**
POST-CLOSURE				
Post-Closure Monitoring	30	Yr	$15,000	$450,000
Subtotal				**$450,000**
Total				**$2,014,688**

6.5 POST-CLOSURE MAINTENANCE

Closure of the Class I Landfill would be as follows: The disposal cell was designed to eliminate infiltration through the cover to prevent the generation of leachate. This was accomplished by promoting drainage and evapotranspiration from the cover, and by preventing percolation of precipitation into the disposal cell. The proposed final cover would consist of the following layers (or equal); Bentomat (ST), 40 mil textured VFPE, Fabricap Geocomposite with 6 oz Geotextile bonded to both sides, and eighteen inches of site soils.

The waste surface would be prepared so as to be free of irregularities, protrusions, vegetation, excessive water, loose soil or abrupt changes in grade. The surface would not contain stones or other matter of such composition, shape, or size, which may be damaging to the geomembrane as specified by the manufacturer. The anchor trenches would be constructed to the lines, widths, and depths recommended by the manufacturer. To avoid damage to the membranes, the edges where the geosynthetic enter the trench would be free of irregularities, protrusions, ect. Backfill operations would be conducted when the geosynthetic matter is at its most contracted state to prevent bridging. The fill material would be placed in a manor to prevent damaging the membrane. The fill material would be compacted to 85% max dry density per ASHTO T-99. Drainage channels would be constructed around the cell as indicated by the drawings to help prevent erosion and divert any run-on and run-off in a controlled manor. Berms would be placed and used as needed.

Post-closure care would be conducted in accordance with this Post-Closure Plan. The schedule for post-closure activities would begin on the date of completion of closure of the disposal cell and continue for 30 years, or until the Executive Secretary determined that the disposal unit had become stabilized and human health and the environment were sufficiently protected. The Owner would initiate post-closure activities within six months following completion of closure. Table 6.2 lists a monitoring and inspection schedule for post-closure care.

TABLE 6.2
POST-CLOSURE MONITORING AND INSPECTION SCHEDULE

Task	Schedule
Landfill Gas	Quarterly
Groundwater	Semiannually
Run-on/Run-off	Quarterly
Leachate Collection System	Quarterly
Cover Erosion	Quarterly
Settlement	Quarterly
Fencing	Quarterly
Vegetation	Quarterly

In the event that significant settlement occurred within the closed landfill, the area would be surveyed and additional soil would be obtained from the site and placed in a manner to preserve the design finish grade. Any such soil placed on the unit would be re-vegetated. Post-closure activities would be financed as outlined in the Financial Assurance Plan. Post-closure care and monitoring would be completed, as determined by the Executive Secretary, when either the 30 year post-closure period was complete, or the unit had stabilized. Upon completion of post-closure care, a post-closure period certificate would be submitted to the Executive Secretary signed by the Owner or Operator.

CHAPTER VII

FINANCIAL ASSURANCE PLAN

7.1 FINANCIAL RESPONSIBILITIES

The Owner has selected to obtain a surety bond guaranteeing performance to meet the criteria set forth in R315-309-3(4). The owner or operator would notify the Executive Secretary that a copy of the bond has been placed in the operating record. As tipping fees are collected, funds will be deposited into a Trust Fund for closure and post-closure care. As the amount in the Trust Fund grows, the performance bond will be devalued accordingly until such time as there are sufficient cash reserves to retire the bond.

CHAPTER VIII

REFERENCES

AQUA Engineering, April 2001, *Class IV Landfill Permit Application,* Tooele County Department of Solid Waste

AQUA Engineering, Revised June 2000, *Amendment to the Class IIIb Landfill Permit Application,* Tooele County Department of Solid Waste

AQUA Engineering, October 1999, *Class II Landfill Permit Application,* Tooele County Department of Solid Waste

Fredlund, D.G. and Rahardjo, h., 1993, *Soil Mechanics for Unsaturated Soils,* Annotation copyright Books News, Inc. Portland, Oregon

Kleinfelder, December 1997, *Permit Application,* Salt Lake Valley Solid Waste Management Facility

NOAA, 1973, NOAA Atlas 2.

United States Geological Survey, 1991, Promontory Point, Utah 7.5 Minute Topographic Quadrangle.

Wood, J. W., 1972, *Hydrologic Reconnaissance of the Promontory Mountains Area Box Elder County, Utah, 1972, Technical Publication No. 38,* State of Utah Department of Natural Resources.

APPENDIX A
CONTRACTS/AGREEMENTS

PACIFIC WEST

1515 West 2200 South, Suite C, Salt Lake City, Utah 84119
Office Telephone: (801) 972-2727 / FAX: (801) 972-0707

August 12, 2003

Dennis R. Downs,
Executive Secratery
Utah Department of Environmental Quality
Division of Solid & Hazardous Waste
P.O. Box 144880
Salt Lake City, Utah 84114-4880

Re: Authorization to Sign for Promontory Landfill

Dear Carl,

Mark H Easton is the authorized representative for Promontory Landfill, LLC the Owner and Pacific West, LLC the Operator for Promontory Landfill. Mark has the authority to sign for Promontory Landfill LLC as its official agent and representative.

Thank you for your consideration of our permit application. If I can be of further help please call any time.

Sincerely,

Jay Harwood
Pacific West LLC - Managing Member
Promontory Landfill, LLC - Managing Member

SHANNON OSTLER
NOTARY PUBLIC • STATE of UTAH
32 NORTH 375 EAST
GRANTSVILLE UT 84029
COMM. EXP. 12-06-2004

Cc Mark H. Easton

Notarized this 12th day of August ,2003

Shannon Ostler
Signature

TOOELE COUNTY CORPORATION
CONTRACT # 03-06-05

AGREEMENT FOR SOLID WASTE DISPOSAL

THIS AGREEMENT is made and entered into as of this 17th day of June, 2003, by and between Tooele County, Utah, a body corporate and politic, located at 47 South Main Street, Tooele, Utah 84074 (hereinafter "County") and Promontory Landfill, LLC, a Utah Limited Liability Company, located at 1515 West 2200 South, Suite C, Salt Lake City, Utah 84119 (hereinafter "Owner").

WHEREAS, Owner is attempting to construct a Class I Landfill on Promontory Point in Box Elder County, Utah that will only accept municipal waste; and

WHEREAS, Owner has applied for a Class I Solid Waste Permit in the name of Promontory Landfill ("Promontory") from the State of Utah, Department of Environmental Quality, Division of Solid and Hazardous Waste; and

WHEREAS, County needs a low cost, long-term solution for its municipal waste that is environmentally sound and in compliance with all solid waste regulations; and

WHEREAS, the Utah Solid Waste Management Act, Section 26-32-1, et. Seq., Utah Code Annotated 1953, as amended (the "Act"), provides that the governing body of a public entity may assume, by agreement, responsibility for the collection and disposition of solid waste whether generated within or outside of it's jurisdictional boundaries and that the said governing body may enter into long-term agreements with private entities to provide for the operation of a solid waste management facility; and

WHEREAS, the County and Owner are desirous of contracting with each other to provide for the disposal and management of solid waste generated by households, governmental offices and retail establishments within the County ("the County's Solid Waste").

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the County and Owner agree as follows:

1. *Disposal Site for County's Solid Waste.* Conditional upon receipt of all licenses and permits required by local, state, and federal law for operation of a Class I Landfill and conditional upon physical construction and opening of Promontory, Owner agrees to provide space within Promontory for the disposal of the County's Solid Waste; provided however, that the County's Solid Waste must be lawfully transported to Promontory by commercial carriers only at the County's sole expense. County and Owner further agree that Promontory shall not be open or otherwise be made

available for access by the general public and that access thereto for the deposit of the County's Solid Waste shall be restricted to those entities licensed by County and approved by Owner for the transport of the County's Solid Waste from the County to Promontory; provided such entities deliver or transport County's Solid Waste in a manner consistent with current practices for the transportation and delivery of the County's Solid Waste to existing landfills in the State of Utah.

Owner hereby reserves the right to reject for disposal any and all of the County's Solid Waste which may be legally classified or identified as a material or substance other than Solid Waste as defined by the Act.

2. *County Agrees to Ship Waste.* Conditional upon Owner's receipt of all licenses and permits required by local, state, and federal law for operation of a Class I Landfill and conditional upon Owner's operation of Promontory in accordance with said licenses and permits, County agrees to ship all or a part of its Solid Waste to Promontory at a mutually agreed upon rate.

3. *County Assistance.* County agrees to provide assistance to Owner through the services of Dave Lore to complete the Class I Landfill permitting process with the Utah Department of Environmental Quality, Division of Solid and Hazardous Waste

4. *Owner Assistance to County.* Owner agrees to assist County to acquiring the lowest best transportation rates for County's Solid Waste from commercial carriers.

5. *Interlocal Agreement.* County employee Dave Lore will assist Owner in forming an Interlocal Agreement with other counties and cities. One function of the Interlocal Agreement will create an Interlocal Council to govern Promontory. Owner agrees to give control of the landfill to an Interlocal Council, including the closure and post-closure funds as well as final ownership of the land. Owner reserves the right to operate Promontory either directly or through its affiliate company, Pacific West LLC.

6. *Term of Agreement.* This Agreement shall be effective upon its execution by County and Owner; provided, however, Owner shall not be obligated to accept the County's Solid Waste for deposit or disposal in Promontory until Owner commences operations at Promontory. This Agreement shall continue in full force and effect (i) so long as Promontory remains in operation under applicable permits issued by the State of Utah and Box Elder County, Utah or (ii) for ten (10) years following the first acceptance of the County's Solid Waste in Promontory or (iii) creation and full execution of an Interlocal Agreement which will supercede this Agreement, whichever of the three options occurs first. The County will

have an option to renew this Contract for an additional period of (ten) years.

7. *Assignment.* This Agreement shall be assignable by Owner only upon the consent of County; provided that the County shall not unreasonably withhold such consent and provided further that the County's prior consent shall not be required for an assignment by Owner to any person or entity currently affiliated with Owner or any assignment by County to Owner.

8. *Applicable Law; Venue.* This Agreement shall be constructed and enforced in accordance with the provisions of the laws of the State of Utah. Venue of any actions brought to enforce, construe, cancel, terminate, rescind or recover for the breach of the provisions of the Agreement shall be in the courts of Salt Lake County, Utah.

9. *Entire Agreement.* The County and Owner acknowledge and agree that this Agreement contains the entire agreement between them and supercedes all previous discussions and oral agreements between them relating in any way to the arrangements for the deposit and delivery of the County's Solid Waste in Promontory and may only be modified or amended by a written agreement executed by both the Owner and the County.

10. *Agreement Binding.* This Agreement shall be binding upon and inure to the benefit of the County's and Owner's successors and assigns.

11. *Enforceability.* The County and Owner represent and warrant to the other that this Agreement is the authorized action of each, that this Agreement is duly executed in conformity with the requirements of all applicable law and that this Agreement is enforceable in accordance with its terms.

This Agreement was executed by Owner and presented to the Governing Body of Tooele County and was accepted and approved by that Governing Body on the 15 day of Dec, 2003.

Tooele County:

Gene S. White Act. Chair

Dennis Rockwell, Chairman
Tooele County Commission

Promontory Landfill, LLC:

Jay Harwood, President

Attest:

Dennis Ewing, Clerk

COUNTY OF TOOELE
COUNTY CLERK
STATE OF UTAH

WEBER COUNTY

DEPARTMENT OF OPERATIONS/
PROPERTY MANAGEMENT
Gary C. Laird
Director

Richard C. Badger
Assistant Director

Danny D. Salazar
Property Management

Ron Perro
Telecommunications

August 14, 2002

Kerry Zundell
Promontory Point Landfill
Clock Tower Building Suite # 302
550 North Main Street
Logan, UT 84321

Dear Kerry:

This is in response to your letter of February 2002 and subsequent meetings with you and the County Commission. As we have discussed on numerous occasions, the prospect for a Municipal Solid Waste Landfill at Promontory Point is exciting to Weber County. We feel that competition in this industry cannot only be healthy for the landfill industry but for the ultimate beneficiaries, the tax payers of the county.

As you are aware we have a contract with East Carbon Development Corporation and would continue to do business with them as long as we are under contract. However, since there is not a guaranteed waste stream under that contract, the county could send a portion of the waste stream to another location as long as it meets our general conditions. These conditions are as follows:

1. The alternate site is permitted by the State of Utah Department of Environmental Quality meeting all of their requirements including, all environmental issues, Historical site issues, Indian artifacts issues, and any groundwater issues, as they relate to the effect on the Great Salt Lake.

2. All containers will be subject to a minimum three-day turn around.

3. The cost of all associated tipping fees, transportation, purchase of rail cars and containers, logistical setups, closure/ post closure fees are less than $16.00/per ton.

4. A closure/post closure fund is to be escrowed and control of those funds be tied to the landfill and cannot be used in any bankruptcy settlement to pay any other outstanding debt except closure of the facility.

5. An alternative truck route in the event of a problem with rail access must be verified. A plan to contract for that service must also be approved by the county.

6. Operations price increases of the landfill must be controlled by the users of the facility who will form a management Board of Directors with each participating entity representing one vote.

7. The term of the agreement will be for *50* years with *5* year outs and an option to renew.

If the PPLR can comply with these conditions, Weber County will commit up to 50% of its solid waste stream, which is approximately 75,000 tons per year.

Our commitment is contingent upon all of the municipalities in Weber County continuing to use the County Transfer Station for solid waste disposal.

Sincerely,

Gary C. Laird
Director

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APPENDIX B
CONDITIONAL USE PERMIT

BOX ELDER COUNTY
WE'VE GOT CONNECTIONS

CONDITIONAL USE PERMIT

Box Elder County

The below listed property, is hereby granted a Conditional Use Permit pursuant to the conditions set forth by the Box Elder County Planning and County Commissioners.

TO: **Promontory Landfill LLC**

CUP #: **CUP 03-02**

USE: **Municipal Solid Waste Facility**

CONDITIONS SET FORTH:

1. All State, Federal and Box Elder County requirements that relate to the siting of the landfill be continuously met;

2. The petitioner submit to all requirements of the Site Plan review prior to final approval of the project;

3. The BRHD approve the culinary water and septic system feasibility for the area;

4. The co-operative inter-local agreement and/or agency (Governing Board) that will oversee the proposed project be established prior issuance of the CUP;

5. If proposed landfill is not in operation within two (2) years from the date of approval by the County Commission, the CUP shall become void;

6. The operation shall be limited to a Class 1 solid waste facility. The facility is restricted from application as a commercial waste facility;

7. Access to the site shall be limited to the railroad causeway or the GSL causeway. No access shall be allowed on existing county roads;

8. The petitioner shall submit a operational time line outlining a projected construction schedule;

9. The operation shall comply with all applicable Box Elder County ordinances, standards and fees.

####

If the use has a lapse in time for any time period greater than 365 days or if the conditions as set forth above are not met, the Conditional Use Permit becomes invalid immediately.

Approved by the Box Elder County Commission this 22nd day of July, 2003.

Suzanne Rees

Suzanne Rees,
Chair, Box Elder County Commission

APPENDIX C
PROOF OF OWNERSHIP

PURCHASE AND SALE AGREEMENT

PURCHASE AND SALE AGREEMENT

THIS PURCHASE AND SALE AGREEMENT ("Agreement") is made and entered into as of the 13th day of June, 2003, by and between PROMONTORY POINT LAND RESOURCES, LLC, a Utah limited liability company ("Seller"), and PROMONTORY LANDFILL, LLC, a Utah limited liability company, its successors and assigns ("Buyer"). Buyer and Seller shall sometimes be referred to herein as the "Parties" or, individually, as a "Party."

RECITALS

A. Seller is the owner of approximately 2,000 acres of unimproved real property located on Promontory Point, Box Elder County, Utah (the "Property").

B. Buyer intends to utilize the Property for a Landfill (as defined below).

C. Seller desires to sell and Buyer desires to purchase the Property, subject to the terms and conditions of this Agreement.

AGREEMENT

NOW, THEREFORE, in consideration of the above recitals, the mutual covenants set forth below in this Agreement, and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, Seller and Buyer agree as follows:

ARTICLE I

DEFINED TERMS

1.1 As used in this Agreement, the following capitalized terms shall have the meanings respectively indicated:

(a) "Buyer's Review Period" means that period of time from the Effective Date until the earlier of (i) the date on which Buyer has obtained the State Permits and the County Permit, or (ii) December 15, 2007.

(b) "Closing" means the transfer of title to the Property by Seller to Buyer in accordance with the terms and provisions of Article VII below.

(c) "Closing Date" means the date specified in Article VII below on which the Closing will be held.

(d) "County Permit" means the conditional use permit to be issued by Box Elder County authorizing Buyer or its assigns to utilize the Property to operate the Landfill.

(e) "Department" means the Department of Environmental Quality, Division of Solid and Hazardous Waste, for the State of Utah.

(f) "Earnest Money Deposit" means that portion of the Purchase Price deposited by Buyer with Seller in the form and amount specified in Section 3.1(a) below.

(g) "Effective Date" means the date on which this Agreement has been executed by both Buyer and Seller.

(h) "Landfill" means a Class I non-commercial nonhazardous waste landfill, as set forth in the Utah Administrative Code.

(i) "Permitted Exceptions" means those exceptions or conditions that affect Seller's title to the Property, but which are acceptable to Buyer, pursuant to Section 4.6, below.

(j) "Property" means the real property referenced in Recital A above and more particularly shown on Exhibit A attached to this Agreement including, all easements, agreements, permits, licenses, rights, rights-of-way, water rights, mineral rights and appurtenances running with or pertaining to the Property.

(k) "State Permits" means the solid waste disposal and ground water discharge permits to be issued by the Department authorizing Buyer or its assigns to operate the Landfill on the Property.

(l) "Title Company" shall mean Integrated Title Insurance Services, LLC, or another title company mutually acceptable to both Parties.

ARTICLE II

AGREEMENT OF PURCHASE AND SALE

2.1 Purchase and Sale. Upon the terms and conditions stated below, and in consideration of the mutual covenants set forth below, the receipt and sufficiency of which are hereby acknowledged, Seller hereby agrees to sell and convey the Property to Buyer and Buyer hereby agrees to purchase the Property from Seller and to pay the Purchase Price (as defined below) to Seller in accordance with the terms and provisions this Agreement.

ARTICLE III

PURCHASE PRICE

3.1 Purchase Price. The purchase price (the "Purchase Price") to be paid by Buyer to Seller for the Property is the sum of Two Hundred Fifty Thousand and No/100 Dollars ($250,000.00), payable as follows:

(a) Earnest Money Deposit. Five Thousand and No/100 Dollars ($5,000.00) in cash to be deposited by Buyer with Title Company (the "Earnest Money Deposit") and applied to the Purchase Price at the Closing. The Earnest Money Deposit shall be held by the Title Company in a federally-insured, interest-bearing account to be applied or delivered as provided below. Buyer shall be entitled to all interest accrued on the Earnest Money Deposit prior to the Closing.

(b) The Closing. Two Hundred Forty-Five Thousand and No/100 Dollars ($245,000.00) in cash to be deposited by Buyer with Title Company at the Closing and paid to Seller at the Closing.

ARTICLE IV

CONDITIONS PRECEDENT

4.1 Commitment for Title Insurance. Upon Buyer's request after the Effective Date, Seller shall obtain from the Title Company and furnish to Buyer a current Commitment for Title Insurance (the "Commitment"), issued by the Title Company, setting forth the state of title to the Property, together with all exceptions or conditions to such title, including without limitation, all liens, mortgages, trust deeds, easements, restrictions, rights-of-way, covenants, reservations, and all other encumbrances affecting the Property, and containing the express commitment of the Title Company to issue a Title Policy (as defined below) for the Property to Buyer in the amount of the Purchase Price, together with true, correct and legible copies of all instruments referred to in the Commitment as conditions or exceptions to title to the Property. At the Closing, Seller shall convey to Buyer fee simple, marketable, and indefeasible title to the Property, free and clear of all liens, encumbrances, and other defects of title, except the Permitted Exceptions.

4.2 Title Insurance. At the Closing, Seller shall cause an ALTA Standard Coverage Owner's Policy of Title Insurance (a "Title Policy") for the Property to be furnished to Buyer. The Title Policy shall be issued through the Title Company in the face amount of the Purchase Price, and shall insure fee simple, indefeasible, marketable title to the Property in Buyer, subject only to the Permitted Exceptions. The cost of the Title Policy shall be paid by Seller.

4.3 Survey. Upon Buyer's request after the Effective Date, Seller shall deliver to Buyer all existing surveys and plat maps of the Property, or any portion thereof, which Seller has in its possession, if any. All such surveys shall be referred to herein as the "Survey," whether one or more.

4.4 Environmental and Other Studies. Upon Buyer's request after the Effective Date, Seller shall deliver to Buyer all environmental studies and assessments, geotechnical and other studies of the Property, or any portion thereof, which Seller has in its possession, if any. Buyer shall have the right to obtain its own environmental assessments, structural and engineering assessments and other studies of the Property, at its own expense. Buyer and its agents shall have the right to enter upon the Property for such purpose. All such studies and assessments shall be referred to in this Agreement as the "Studies."

4.5 Governmental Documents. Upon Buyer's request after the Effective Date, Seller shall deliver to Buyer copies of all information, agreements and documentation in Seller's possession relating to zoning, conditional use permits and any other governmental approvals or restrictions regarding the Property ("Governmental Documents").

4.6 Review of Materials by Buyer. Buyer shall have access to the Property commencing on the Effective Date of this Agreement. During Buyer's Review Period, Buyer shall review the Survey, the Commitment, and any documents referred to in either, and deliver in writing, by the end of Buyer's Review Period, such objections as Buyer may have to anything contained or set forth in the Survey, the Commitment, or any of the documents or conditions referred to in either. Any such items to which Buyer does not object by the end of Buyer's Review Period shall be deemed to be "Permitted Exceptions". During Buyer's Review Period, Buyer shall also review the Studies and Governmental Documents. If, within such period, Buyer determines that the Studies reveal facts, conditions or risks with respect to any of the Property that are unacceptable to Buyer or if Governmental Documents are not acceptable to Buyer, then Buyer shall have the right to terminate this Agreement, by written notice to Seller and the Title Company. Buyer's review and acceptance or rejection of the Survey, the Commitment, Studies and Governmental Documents shall be in Buyer's sole judgment and discretion. In the event of a termination of this Agreement based on such review, the Title Company shall promptly return the Earnest Money Deposit (including all accrued interest) to Buyer and the Parties shall be relieved of all further duties and obligations hereunder.

4.7 Issuance of Landfill Permits. Buyer's obligation to close on the purchase of the Property is contingent upon (i) the issuance by the Department of the State Permits to Buyer, or an affiliate of Buyer, authorizing Buyer or its affiliate to operate the Landfill on the Property, and (ii) the issuance by Box Elder County of the County Permit to Buyer, or an affiliate of Buyer, authorizing Buyer or its affiliate to operate the Landfill on the Property. If Buyer is unable to obtain the State Permits and the County Permit on or before the Closing Date, then Buyer shall have the right, but not the obligation, to terminate this Agreement by written notice to Seller and the Title Company. In such an event, the Title Company shall promptly return the Earnest Money Deposit (including all accrued interest) to Buyer and the Parties shall be relieved of all further duties and obligations hereunder.

4.8 License. Seller hereby grants to Buyer a license to enter and inspect the Property. The Property shall be returned to its original condition upon completion of any investigations and Buyer agrees to indemnify and hold Seller harmless from and against any and all claims, costs, damages, liabilities or losses arising as a result of or in any way connected with Buyer's inspection of the Property.

4.9 Seller's Obligation to Cure Buyer's Objections to Title. If exceptions to the title to the Property have been raised in the Commitment or accompanying documents and if Buyer delivers written objections thereto to Seller in accordance with Section 4.6 above, then Seller shall, prior to the Closing Date, use reasonable efforts to satisfy such objections. If Seller fails to cure Buyer's objections to title prior to the Closing Date, Buyer may either waive such objections or terminate this Agreement on or before the Closing Date, by written notice to Seller and the Title Company, in which event the Earnest Money Deposit (including all accrued interest) shall be returned to Buyer, and the Parties shall be released of all duties and obligations hereunder.

4.10 No Condemnation or Damage. Buyer shall not be obligated to purchase the Property if, prior to the satisfaction of all conditions set forth in this Article IV, the Property, or any portion thereof, has been condemned or sold under threat of condemnation, is the subject of a condemnation proceeding or threat, or has been damaged by fire, earthquake or other event or occurrence. In such event, and upon written notice by Buyer to Seller and the Title Company, this Agreement shall terminate, the full amount of the Earnest Money Deposit (including all accrued interest) shall be returned to Buyer, and the Parties shall be released of all duties and obligations hereunder.

4.11 Buyer's Right to Waive Conditions Precedent. Notwithstanding anything which may be contained in this Agreement to the contrary, Buyer may, at Buyer's sole option, elect to waive any of the conditions precedent to the performance of its obligations hereunder contained in this Article IV by written notice from Buyer to Seller. In the event of any waiver of any condition precedent to Buyer's obligations hereunder, this Agreement shall continue in full force and effect with respect to all other terms, provisions and conditions herein.

4.12 Non-Refundable Earnest Money Deposit. At the conclusion of the Buyer's Review Period, if Buyer has not terminated this Agreement, then the Earnest Money Deposit shall become non-refundable, except in the event of a default by Seller hereunder or the condemnation or damage of the Property under Section 4.10, above. At all time prior to the conclusion of the Buyer's Review Period the Earnest Money Deposit shall be fully refundable to Buyer, together with all accrued interest thereon, in the event of any termination of this Agreement.

4.13 Seller's Cooperation. Seller agrees to cooperate with Buyer in connection with Buyer's due diligence during Buyer's Review Period, as and when reasonably requested by Buyer.

ARTICLE V

REPRESENTATIONS, COVENANTS AND AGREEMENTS OF SELLER

5.1 Representations of Seller. Seller represents and warrants to Buyer the following as of the date this Agreement is fully executed and as of the Closing Date, except where specific reference is made to another date or dates, in which case such date or dates shall be applicable:

(a) That Seller is, or by the Closing Date will be, the sole owner of the Property, and on the Closing Date Seller will have, and will convey to Buyer by special warranty deed, title to the Property, free and clear of all conditions, exceptions, encumbrances or reservations, except the Permitted Exceptions;

(b) That Seller has not received written notice of any pending or contemplated condemnation action with respect to the Property, or any part thereof;

(c) That Seller does and will have, at the time of the Closing, the full right, power, and authority to sell and convey the Property to Buyer as provided in this Agreement and to carry out Seller's obligations hereunder;

(d) That no third Party has been granted any lease, license, or other right relating to the use or possession of the Property after the Closing Date;

(e) That the Property is not subject to claims from any persons or entities based on prior negotiations, sales, or agreements regarding the Property; and

(f) That Seller has full power and proper authority to execute this Agreement and to perform all of its terms and conditions without violation of Seller's charter documents or other contractual or legal obligations, and that all required actions necessary to authorized Seller to enter into this Agreement and to carry out its obligations hereunder have been taken.

ARTICLE VI

REPRESENTATIONS, COVENANTS, AND AGREEMENTS OF BUYER

6.1 Representations of Buyer. Buyer represents, warrants, covenants, and agrees with Seller, as of the date this Agreement is fully executed and as of the Closing Date, that Buyer has or will have the full right, power, and authority to purchase the Property from Seller as provided in this Agreement and to carry out its obligations hereunder, and that all required action necessary to authorize Buyer to enter into this Agreement and to carry out its obligations hereunder has been taken, or upon the Closing, will have been taken.

ARTICLE VII

CLOSING

7.1 Date and Place of the Closing. The Closing shall take place in the offices of the Title Company, or such other location as Buyer and Seller shall agree, and shall be the earlier of (i) thirty (30) days after Buyer has obtained the State Permits and the County Permit or (ii) December 31, 2007 (the "Closing Date").

7.2 Items to be delivered at the Closing.

(a) Seller. On or before the Closing Date, Seller shall deliver to the Title Company each of the following items, together with instructions to deliver the same to Buyer at the Closing:

(i) Special Warranty Deed to the Property, the form of which is acceptable to Buyer and the Title Company, duly executed and acknowledged by Seller, conveying good, marketable, and indefeasible fee simple title to the Property to Buyer, subject only to the Permitted Exceptions;

(ii) A certification of nonforeign status pursuant to Section 1445 of the Internal Revenue Code, in a form acceptable to Buyer and the Title Company; and

(iii) All additional documents and instruments which the Buyer or the Title Company reasonably determine to be necessary to the consummation of this transaction.

(b) Buyer. On or before the Closing Date, Buyer shall deliver to the Title Company each of the following items:

(i) Cashier's check or bank-to-bank wire transfer to the Title Company for delivery to Seller, funds in the sum of the Two Hundred Fifty Thousand and No/100 Dollars ($250,000.00) (less the Earnest Money Deposit and all accrued interest), plus Buyer's share of closing costs and prorations, as provided below, less all costs, expenses, and prorations to be paid by Seller; and

(ii) All additional documents and instruments which the Seller or the Title Company reasonably determine to be necessary to the consummation of this transaction.

7.3 Closing Prorations. Ad valorem and similar taxes and assessments relating to the Property shall be prorated between Seller and Buyer as of midnight of the Closing Date, based upon the amount shown for real property taxes in the most recent tax notice issued for the Property as assessed by the county assessor. Seller shall also pay any roll back taxes due under the Farmland Assessment Act resulting from any change of use of the Property occurring on or before the Closing Date and shall indemnify and hold harmless Buyer from all such charges or taxes whenever they are levied. All other expenses of the Property shall also be prorated as of midnight of the Closing Date. The provisions of this Section shall survive the Closing.

7.4 Closing Costs. All escrow and closing fees charged by the Title Company shall be divided equally between, and paid by, Buyer and Seller. Seller shall pay all recording fees. Seller shall pay the premium for the Title Policy.

ARTICLE VIII

DEFAULTS AND REMEDIES

8.1 Seller's Defaults; Buyer's Remedies.

(a) Seller's Defaults. Seller shall be deemed to be in default hereunder upon the occurrence of any one or more of the following events:

(i) Any of Seller's warranties or representations set forth herein shall be or become untrue at any time on or before the Closing Date;

(ii) Seller shall fail to meet, comply with, or perform any covenant, agreement, or obligation on its part required within the time limits and in the manner required in this Agreement.

(b) Buyer's Remedies. In the event Seller shall be deemed to be in default hereunder and so long as Buyer is not then in default hereunder, Buyer may, at Buyer's sole option, exercise any one or more of the following remedies:

(i) Terminate this Agreement by written notice to Seller, in which event the Earnest Money Deposit (including all accrued interest) shall be returned to Buyer, and the Parties shall be released of all duties, obligations, or liabilities to each other hereunder; or

(ii) Obtain specific performance of this Agreement.

8.2 Buyer's Default; Seller's Remedy. In the event any of Buyer's warranties or representations set forth herein shall be untrue as of the Closing Date, or if all of Buyer's conditions precedent have been either satisfied or waived and Buyer shall fail to close on its purchase of the Property as set forth herein, and so long as Seller is not then in default hereunder, Seller, as its sole and exclusive remedy, shall have the right to terminate this Agreement by written notice to Buyer and the Title Company, in which event the Earnest Money Deposit shall be delivered to the Seller, together will all accrued interest thereon, and the Parties shall have no further duties or obligations to each other hereunder.

ARTICLE IX

BROKERAGE COMMISSION

9.1 Indemnity. Seller and Buyer represent and warrant to each other that neither has contacted any real estate broker, finder, or other Party in connection with this transaction, to whom any real estate brokerage, finder, or other fees may be due or payable with respect to the transaction contemplated hereby. Seller and Buyer hereby indemnify and agree to hold each other harmless from any loss, liability, damage, cost, or expenses (including reasonable attorney's fees) related to anyone claiming a commission or fee with respect to the sale of the Property as a result of any statement, agreement, or other alleged act of the other.

ARTICLE X

MISCELLANEOUS

10.1 References. All references to "Article", "articles", "section", or "Sections" contained herein are, unless specifically indicated otherwise, references to Articles and Sections of this Agreement.

10.2 Exhibits. All references to "Exhibits" contained herein are references to exhibits attached hereto, all of which are made a part hereof for all purposes.

10.3 Captions. The captions, headings, and arrangements used in this Agreement are for convenience only and do not in any way affect, limit, amplify, or modify the terms and provisions hereof.

10.4 Number and Gender of Words. Whenever herein the singular number is used, the same shall include the plural where appropriate, and words of any gender shall include each other gender where appropriate.

10.5 Attorneys' Fees. If any action is brought or counsel otherwise employed to enforce this Agreement or any provision thereof, to collect damages for an alleged breach thereof, or for a declaratory judgment thereunder, the prevailing Party in such action or the Party forced to take action that does not involve litigation shall be entitled to an allowance for reasonable attorneys' fees in addition to costs of suit.

10.6 Notices. All notices, demands, requests, and other communications required or permitted hereunder shall be in writing, and shall be personally delivered, mailed by certified or registered mail, postage prepaid, transmitted by facsimile, or sent by overnight courier service and addressed as follows:

If to Buyer:	Promontory Landfill, LLC Attention: Jay Harwood 1515 West 2200 South, Suite C Salt Lake City, Utah 841190 Fax: (801) 972-0707
If to Seller:	Promontory Point Land Resources, LLC 230 West Main Street Tremonton, Utah 84337 Fax: (435) ______________
If to Title Company:	Integrated Title Insurance Services, LLC Attention: Mike Kirby 6925 Union Park Center, Suite 160 Midvale, Utah 84047 Fax: (801) 307-0170

If mailed, such communications shall be deemed to be delivered, whether actually received or not, three (3) days after deposit in a regularly maintained receptacle for the United States mail. If sent by overnight courier, such communications shall be effective on the date actually delivered. If sent by facsimile, such communications shall be effective on the date transmitted upon receipt of successful transmission.

10.7 Governing Law. The laws of the State of Utah shall govern the validity, construction, enforcement, and interpretation of this Agreement, unless otherwise specified herein.

10.8 Entirety and Amendments. This Agreement embodies the entire agreement between the Parties and supersedes any prior agreements and understandings, if any, relating to the Property, and may be amended or supplemented only by an instrument in writing executed by both Seller and Buyer.

10.9 Invalid Provisions. If any provision of this Agreement, except the provisions relating to Seller's obligation to convey the Property and Buyer's obligation to pay the Purchase Price, the invalidity of either of which shall cause this contract to be null and void, is held to be illegal, invalid, or unenforceable under this Agreement shall be construed and enforced as if such illegal, invalid, or unenforceable provision had never comprised a part of this Agreement; and the remaining provisions of this Agreement shall remain in full force and effect and shall not be affected by the illegal, invalid, or unenforceable provision or by its severance from this Agreement.

10.10 Multiple Counterparts. This Agreement may be executed by facsimile and in a number of identical counterparts. If so executed, each of such counterparts is to be deemed an original for all purposes, and all such counterparts shall, collectively, constitute one agreement, but in making proof of this Agreement, it shall not be necessary to produce or account for more than one such counterpart.

10.11 Parties Bound. This Agreement is freely assignable, and shall be binding upon and inure to the benefit of Seller and Buyer, and their respective heirs, successors and assigns.

10.12 Further Acts. In addition to the acts and deeds recited herein and contemplated to be performed, executed, and delivered by Seller and Buyer, Seller and Buyer agree to perform, execute, and deliver or cause to be performed, executed, and delivered at the Closing or after the Closing any and all such further acts, deeds, and assurances as may be necessary to consummate the transactions contemplated hereby.

EXECUTED as of the day and year first above written.

BUYER:

PROMONTORY LANDFILL, LLC

By: ______________________
Jay Harwood
Its: Manager

SELLER:

PROMONTORY POINT LAND RESOURCES, LLC

By: ______________________
Name: ______________________
Its: Manager

Exhibit A
to
Purchase and Sale Agreement

Legal Description of the Property

The real property situated in Box Elder County, Utah, more particularly described as follows:

THE EAST HALF OF THE NORTHWEST QUARTER, SECTION 19, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER, SECTION 19, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTHWEST QUARTER, SECTION 19, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE WEST HALF OF THE NORTHEAST QUARTER, SECTION 30, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE WEST HALF OF THE NORTHWEST QUARTER, SECTION 30, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTHEAST QUARTER, SECTION 13, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER, SECTION 14, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER, SECTION 23, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTH HALF OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER, SECTION 23, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER, SECTION 23, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

LESS: THE EXISTING COUNTY ROAD AND ALL LAND LYING WESTERLY OF SAID COUNTY ROAD.

THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER, SECTION 23, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

LESS: THE EXISTING COUNTY ROAD AND ALL LAND LYING WESTERLY OF SAID COUNTY ROAD.

THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER, SECTION 23, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

LESS: THE EXISTING COUNTY ROAD AND ALL LAND LYING WESTERLY OF SAID COUNTY ROAD.

THE NORTHEAST QUARTER, SECTION 24, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTH HALF, SECTION 24, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

THE NORTHEAST QUARTER, SECTION 25, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTHEAST QUARTER, SECTION 25, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

LESS: THE EXISTING COUNTY ROAD AND ALL LAND LYING SOUTHERLY OF THE SAID COUNTY ROAD.

THE SOUTHWEST QUARTER, SECTION 25, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

LESS: THE EXISTING COUNTY ROAD AND ALL LAND LYING SOUTHWESTERLY OF SAID COUNTY ROAD.

THE NORTHWEST QUARTER, SECTION 25, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

LESS: THE EXISTING COUNTY ROAD AND ALL LAND LYING SOUTHWESTERLY OF SAID COUNTY ROAD.

THE WEST HALF OF THE SOUTHWEST QUARTER OF SECTION 18, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 18, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE WEST HALF OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER, SECTION 18, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 18, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 6 NORTH, RANGE 5 WEST, SALT LAKE BASE AND MERIDIAN.

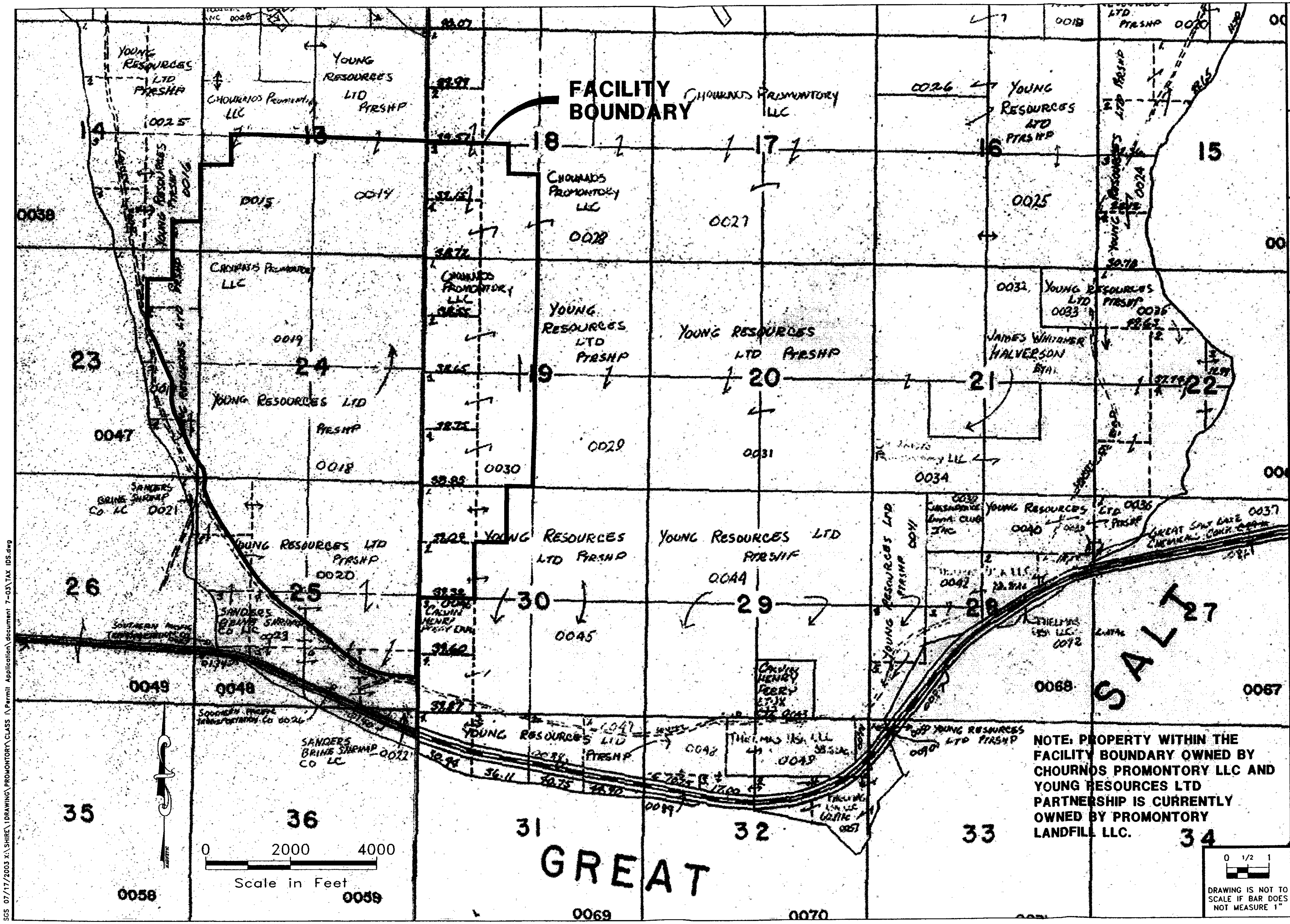
THE SOUTHWEST QUARTER OF SECTION 13, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

LESS: THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 13, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

THE NORTHWEST QUARTER OF SECTION 24, TOWNSHIP 6 NORTH, RANGE 6 WEST, SALT LAKE BASE AND MERIDIAN.

TOGETHER WITH ALL IMPROVEMENTS, APPURTENANCES AND ANY WATER RIGHTS THERETO BELONGING.

COUNTY RECORDER TAX ID MAP



DESIGN: CAH
DRAWN: TWE
CHECKED: CAH
SCALE: HORZ. AS SHOWN VERT. NONE
DATE: DEC. 2002

ENGINEERS SEAL

REVISIONS

NO.	DATE

PROMONTORY LLC

PROMONTORY LANDFILL FACILITY
CLASS I LANDFILL PERMIT APPLICATION
COUNTY RECORDER TAX ID MAP

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE:
-

SCS 07/17/2003 X:\SHIRE\DRAWING\PROMONTORY\CLASS I\Permit Application\document 7-03\TAX IDS.dwg

APPENDIX D
GEOTECHNICAL AND GEOLOGIC STUDY

AQUA ENGINEERING, INC.

Applied Geotechnical Engineering Consultants, Inc.

GEOTECHNICAL AND GEOLOGIC STUDY

PROMONTORY LANDFILL, LLC
CLASS I LANDFILL

PERMIT APPLICATION

BOX ELDER COUNTY, UTAH

PREPARED FOR

AQUA ENGINEERING, INC.
533 WEST 2600 SOUTH, SUITE 275
BOUNTIFUL, UTAH 84010

ATTENTION: CRAIG NEELEY/CHET HOVEY

PROJECT NO. 1020875 **JULY 21, 2003**

600 West Sandy Parkway • Sandy, Utah 84070 • (801) 566-6399 • FAX (801) 566-6493

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EXECUTIVE SUMMARY

1. The site is suitable for the proposed construction. The natural soil and bedrock encountered at the site are suitable for support of the proposed landfill.

2. The subsurface conditions encountered in the test pits consist of topsoil overlying clay in the upper 1 to 5 feet or sand and gravel. Clay layers up to approximately 11½ feet thick were encountered at depth in 4 of the explorations.

   Bedrock was encountered below the topsoil in one exploration and at depths of approximately 1 to 14 feet in 14 of the explorations. Possible bedrock was encountered in two of the explorations at depths of 7 and 14 feet.

   Subsurface conditions encountered in Monitor Well MW-1 consist of sand and gravel extending to a depth of approximately 43 feet below the ground surface overlying bedrock which extended the full depth of the monitor well, approximately 61½ feet. The subsurface conditions encountered in Monitor Wells MW-2 through MW-4 consisted of sand and gravel with occasional thin clay layers extending to the maximum depth investigated, approximately 100 feet below the ground surface. Subsurface conditions encountered in Monitor Well MW-5 consist of sand and gravel with occasional clay layers extending to a depth of approximately 41 feet below the ground surface overlying bedrock to the maximum depth of the monitor well, approximately 243 feet.

3. No subsurface water was encountered in the test pits at the time of excavation. Subsurface water was measured at depths of approximately 33, 32½,32, 36 and 219 feet below the ground surface in Monitor Wells MW-1 through MW-5, respectively, based on measurements taken June 18, 2003.

4. Excavation of the overburden soil at the site, with the exception of cemented layers, may be accomplished with conventional excavation equipment. Cemented layers and bedrock may require heavy-duty ripping or possibly blasting to excavate significant depths into the material.

Executive Summary Continued

5. The on-site materials may be utilized for construction of the landfill. Soil and bedrock which can be adequately broken down into appropriate particle sizes may be utilized as soil cover material. The on-site gravel may be considered for use as drainage material if it has less than 5 percent passing the No. 200 sieve.

6. The slope of the waste and closure material may be constructed at slopes of 4 horizontal to 1 vertical or flatter. Stability analysis indicates a safety factor of 1.9 under static conditions. A pseudo-static analysis was conducted for a seismic event having a 2 percent probability of exceedance in a 50 year period. The analysis indicates a small to moderate amount of displacement is likely under this seismic condition with predicted movement on the order of 15 centimeters for slopes constructed at 4 horizontal to 1 vertical. Waste and closure material interfaces having a friction angle of 25 degrees or higher were assumed.

7. Settlement analysis was conducted for the landfill foundation assuming the final configuration with 4 horizontal to 1 vertical slopes on the closure cap and assuming approximately 10 feet of soil is removed. Settlement on the order of 10 inches is estimated for the central portion of the landfill area once full loading conditions have been achieved. Settlement is estimated to be less than 2 inches around much of the perimeter of the landfill due to the presence of shallow bedrock. The predicted magnitude of settlement resulting from the completed landfill is presented on Figure 26. An additional 0 to 6 inches of bedrock strain is estimated under the load of the landfill and is not included in the settlement estimates on Figure 26.

8. There are no geologic hazards which will be of concern for the proposed development with the exception of strong ground shaking due to earthquake activity.

9. Geologic conditions, materials and construction precautions are contained in the report.

SCOPE

This report presents the results of a geotechnical and geologic study for the permit application for the proposed Promontory Point Landfill to be located on the southwest portion of the Promontory Point Peninsula in Box Elder County, Utah. The report presents the subsurface conditions encountered, laboratory test results and geotechnical recommendations for design and construction of the proposed landfill. The study was conducted in general accordance with our proposals dated December 18, 2002 and February 5 and February 12, 2003. A letter containing preliminary information was previously presented and is dated December 30, 2002.

Field exploration was conducted to obtain information on the subsurface conditions. Samples obtained from the field investigation were tested in the laboratory to determine physical and engineering characteristics of the on-site materials. Information obtained from the field and laboratory was used to define conditions at the site for our engineering analysis and to develop recommendations for the proposed landfill.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report.

SITE CONDITIONS

The following is a brief description of the site at the time of our field study.

The site is located at the southeast edge of the promontory mountains near Saline, Utah. The site consists of open range land. There are no existing structures or pavement on the site. There is an existing water well on the site.

There are several small fill piles of trash near Test Pit TP-26. Two abandoned cars are located between Test Pits TP-21 and TP-22.

Several overhead utility lines extend through the site.

There are rock outcrops on the east and west portions of the site.

Two large drainages and several smaller drainages are located in the central portion of the site. The site slopes gently to moderately down to the south/southwest.

The site is vegetated with grasses, weeds and sagebrush.

FIELD STUDY

Test Pits TP-1 through TP-27 were excavated at the site on December 11, 12, 13, and 16, 2002. These test pits were excavated throughout a 1,000 acre area considered for the proposed facility. Test Pits A-1 through A-9 were excavated on December 23, 2002. The test pits were excavated using a track-mounted backhoe provided by the client.

Monitor Wells MW-1 through MW-4 were drilled and installed on January 23, 24, 27, 28 and 29, 2003, with 4 inch Odex drilling system. Monitor Well MW-5 was drilled and installed May 14 through May 21, 2003 with 8 inch Odex/air rotary methods.

The monitor wells were drilled and test pits excavated at the approximate locations indicated on Figure 2. Test pits and monitor wells were logged and soil and bedrock samples obtained by a geologist from AGEC. Logs of subsurface conditions encountered during drilling of the monitor wells and logs of the monitor wells as installed are presented on Figures 3 through 8. Logs of the subsurface conditions encountered in the test pits are presented on Figure 9 through 12. Legend and notes of the monitor wells and test pits are shown on Figure 13.

SUBSURFACE CONDITIONS

The subsurface conditions encountered in the test pits consist of approximately 2 to 9 inches of topsoil overlying clay in the upper 1 to 5 feet of Test Pits TP-1, TP-2, TP-8, TP-11, TP-20, TP-21, TP-22 and A-1 and sand and gravel in the other test pits. Clay layers up to approximately 11½ feet thick were encountered at depth in Test Pits TP-11, TP-23, A-4 and A-8.

Bedrock was encountered below the topsoil in Test Pit TP-4 and at depths of approximately 1 to 14 feet in Test Pits TP-6, TP-8, TP-12, TP-15, TP-16, TP-19, TP-21, TP-22, TP-24, TP-25, A-1, A-2, A-3 and A-5. Possible bedrock was encountered in Test Pits TP-18 and TP-27 at depths of 14 and 7 feet, respectively.

Subsurface conditions encountered in Monitor Well MW-1 consist of sand and gravel extending to a depth of approximately 43 feet below the ground surface overlying bedrock which extended the full depth of the monitor well, approximately 61½ feet. The subsurface conditions encountered in Monitor Wells MW-2 through MW-4 consisted of sand and gravel with occasional thin clay layers extending to the maximum depth investigated, approximately 100 feet below the ground surface. Subsurface conditions encountered in Monitor Well MW-5 consist of sand and gravel with occasional clay layers extending to a depth of approximately 41 feet below the ground surface overlying bedrock to the maximum depth of the monitor well, approximately 243 feet.

A description of the various materials encountered in the test pits and borings for monitor wells is indicated below.

Topsoil - The topsoil consists of silty and clayey sand and gravel to lean clay. Cobbles and occasional boulders were encountered in the topsoil. The topsoil is slightly moist, brown and contains roots.

Lean Clay - The clay contains small to moderate amounts of gravel. The clay is porous in Test Pits TP-1, TP-2 and A-1. The clay contains cobbles and occasional boulders up to 3 feet in size. It is stiff to very stiff, slightly moist and wet at depth in the borings. It is brown to reddish brown to grayish brown in color.

Laboratory tests conducted on samples of the clay indicate natural moisture contents range from 8 to 18 percent and natural dry densities range from 74 to 113 pounds per cubic foot (pcf).

Consolidation tests conducted on samples of the clay indicate that the soil will compress a moderate amount with the addition of moderate to heavy loads. Results of the consolidation tests are presented on Figures 14 through 19. Some of the clay in the upper approximate 4 feet, such as in Test Pit TP-1, is moisture sensitive, becoming more compressible when wetted. We anticipate that the upper clay will be removed from below the proposed landfill.

Clayey Sand with Gravel - The sand contains clayey gravel layers, cobbles and occasional boulders up to 1 ½ feet in size. It is medium dense to dense, slightly moist to moist and brown in color.

Results of laboratory tests conducted on samples of the clayey sand indicate a natural moisture content of 5 percent and a natural dry density of 90 pcf.

The results of a gradation test conducted on a sample of the clayey sand are presented on Figure 23. The results of gradation and moisture density relationship (Proctor) tests conducted on samples ranging from sandy silt clay to clayey gravel with sand are presented on Figures 24 and 25.

A consolidation test conducted on a sample of the clayey sand indicates that the soil will compress a small to moderate amount with the addition of moderate to heavy loads. Results of the test are presented on Figure 18. The upper approximate 4 feet in some areas such as Test Pit TP-20 is moisture sensitive, becoming more compressible when wetted. We anticipate that the upper material will be removed from below the proposed landfill.

A sample of the sandy, silty clay was remolded to 95 percent of the maximum dry density as determined by ASTM D-698 and a permeability test conducted on a remolded sample. The test results indicate a permeability of 1×10^{-5} centimeters per second.

<u>Silty Sand with Gravel</u> - The sand contains clayey layers and gravel layers. Occasional cemented layers, cobbles and occasional boulders were encountered. The sand is medium dense to very dense, slightly moist and brown to reddish brown in color.

Laboratory tests conducted on samples of the silty sand indicate natural moisture contents range from 3 to 6 percent and natural dry densities range from 97 to 124 pcf. The results of a gradation test conducted on a sample of the sand are presented on Figure 21.

Poorly Graded Sand with Gravel - The sand contains gravel layers, cobbles and occasional boulders. Occasional cemented layers were encountered. The sand is medium dense to very dense, slightly moist to moist, wet at depth in the borings and brown to grayish brown to reddish brown in color.

The results of laboratory tests conducted on a sample of the sand indicate a natural moisture content of 7 percent.

The results of gradation tests conducted on samples of the sand are presented on Figures 20, 21 and 22.

Clayey Gravel with Sand and Clayey Sand with Gravel - The sand and gravel is interlayered. It contains cobbles and occasional boulders and occasional clay layers. It is dense to very dense, slightly moist to moist, wet at depth in the borings and brown to gray in color.

Laboratory tests conducted on samples of the sand and gravel indicate natural moisture contents range from 4 to 13 percent and natural dry densities range from 114 to 130 pcf.

Clayey Gravel with Sand - The gravel contains clayey sand layers and occasional clay layers. Cobbles and boulders up to approximately 2 feet in size and occasional cemented layers were encountered. The gravel is medium dense to very dense, slightly moist to moist, wet at depth in the borings and brown to gray in color.

Laboratory tests conducted on samples of the gravel indicate natural moisture contents range from 8 to 13 percent and a natural dry density of 120 pcf.

The results of a gradation test conducted on a sample of the clayey gravel are presented on Figure 20.

Silty Gravel with Sand - The gravel contains silty sand layers, cobbles up to approximately 1 foot in size and occasional cemented layers. It is dense to very dense, slightly moist and brown in color.

Poorly Graded Gravel with Sand - The gravel contains sand layers, occasional cemented layers, cobbles and boulders up to approximately 2 feet in size. It is medium dense to very dense, slightly moist to moist, wet at depth in the borings and brown to grayish brown in color.

The results of gradation tests conducted on samples of the gravel are presented on Figures 22 and 23.

Bedrock - The bedrock consists of quartzite and dolomite. It is hard to very hard, dry to wet, grayish white to gray to purple in color.

Results of the laboratory tests are included on logs of the borings and test pits and are summarized on Table I.

SUBSURFACE WATER

No subsurface water was encountered in the test pits at the time of excavation. Subsurface water was measured at depths of approximately 33, 35, 33, 35 and 220 feet below the ground surface in Monitor Wells MW-1 through MW-5, respectively, based on measurements taken at the time of drilling.

There is an existing well on the site near Test Pit TP-17 which is an approximate 6 inch diameter, steel cased well with a submersible pump. Based on the contours shown on Figure 2, we estimate the well to have an elevation of approximately 4330 feet. Water was measured in the well on January 28, 2003 and again on June 18, 2003 at a depth of approximately 120 feet below the ground surface.

PROPOSED CONSTRUCTION

We understand that the facility encompasses approximately 2,006 acres and the proposed Class 1 landfill will encompass approximately 1,000 acres.

We understand that the proposed construction will include liner systems overlain by municipal solid waste with a closure cap. We understand that the liner system will be constructed over the on-site soil or bedrock. The liner system will consist of the following from top to bottom:

- non-woven geosynthetic fabric
- gravel
- non-woven geosynthetic fabric
- geosynthetic membrane liner
- geosynthetic clay liner (GCL)

Municipal waste will be placed above the liner system. The closure cap will consist of the following from top to bottom.

- soil cover
- geosynthetic drainage net
- textured geosynthetic membrane liner
- geosynthetic clay liner (GCL)

We understand that the waste and closure cap will have a slope of 4 horizontal to 1 vertical.

We anticipate that the site will be excavated on the order of 10 to 15 feet below the existing

grade prior to constructing the lining systems. We understand that permanent excavation slopes for landfill lining systems will be cut at 3 horizontal to 1 vertical or flatter.
If the proposed construction is different from what is described above, we should be notified to reevaluate our recommendations.

GEOLOGY

A. Regional Geology

The Promontory Mountains are a part of the Basin and Range Province. The province is made up of north/south elongated mountain blocks and valleys. The Promontory Mountains form one of the mountain blocks in the province with the Great Salt Lake occupying a portion of the valleys on either side.

The valleys were once occupied by a large lake known as Lake Bonneville during the Wisconsin Glacial period of the Pleistocene Age. The present day Great Salt Lake is a remnant of ancient Lake Bonneville. Stillstands of Lake Bonneville formed benches along the margins of the mountain blocks. The highest level of Lake Bonneville is marked by a bench, the Bonneville shoreline, at approximate elevation 5280 feet. The lake remained at this high level from approximately 17,000 to 15,000 years before present (B.P.) until it dropped approximately 350 feet during a catastrophic flood known as the Bonneville Flood (Currey and Oviatt, 1985 and Jarrett and Malde, 1987). Two lower stillstands of Lake Bonneville are the Provo (approximately 13,000 years B.P.) and Gilbert (approximately 10,000 years B.P.) which formed at approximate elevations 4930 and 4330 feet, respectively (Currey and others, 1983). The most recent high-water level, known as the Holocene High, occurred approximately 2,600 years B.P. with an approximate elevation of 4220 feet.

The site is at an elevation ranging from approximately 4230 feet to 5200 feet, placing the site between just above the Holocene High to just below the Lake Bonneville shoreline.

B. Stratigraphy

The Quaternary sediments at the site consist predominantly of Lake Bonneville deposits with a thin veneer of alluvium and colluvium. Bedrock in the area consists of Cambrian and Pre-Cambrian-aged rock (Crittenden, 1988).

The Quaternary sediments consist predominantly of sand and gravel representing primarily transgressive phases of Lake Bonneville shoreline deposits. Some clay was encountered at the site which generally represents deeper lake sediments deposited during the high stands of Lake Bonneville.

Four bedrock formations have been mapped within the property boundaries (see Figure 1). The youngest of these deposits is the middle and lower Cambrian-aged limestone and shale consisting of interbedded, thin-bedded, medium-gray, limestone and olive-drab shale.

The interbedded limestone and shale is underlain by lower Cambrian-aged Geertsen Canyon Quartzite which consists of deep reddish-black hematitic quartzite.

The Geertsen Canyon Quartzite is underlain by the late Proterozoic-aged Browns Hole Formation which consists of pale-gray, very-fine-grained, vitreous quartzite.

The late Proterozoic-aged Mutual Formation underlays the Browns Hole Formation and consists of thick-bedded, coarse-grained quartzite intercalated with a few beds of siltstone and shale.

C. Structure

Due to the age of the bedrock, the bedrock is highly faulted, fractured and deformed. The attitude of beds varies significantly across the site. The dip of beds northeast of the site is generally down toward the northeast with a dip angle ranging from 30 to 45 degrees.

D. Tectonic Setting

The Promontory Mountains are bounded on the west by a fault known as the East Great Salt Lake Fault (Hecker, 1993). The fault is mapped to extend within approximately 800 feet west of the west edge of the property. The East Great Salt Lake Fault is considered to have had movement within the Quaternary and possibly within the Holocene time period. Quaternary slip rates for the fault are estimated to be on the order of 0.4 to 0.7 millimeters per year which is approximately half the slip rate for the Wasatch Fault (Pechmann, 1987).

A recent study (Dinter and Pechmann, 1998) using seismic reflection methods found the East Great Salt Lake Fault to be approximately 2 miles west of the southwest edge of the property.

E. Geologic Hazards

Geologic hazards reviewed for the project consist of surface fault rupture, ground shaking, landslide, debris flow, rockfall, subsidence, dam failure flood, mining activity, salt dome and salt bed.

1. Surface Fault Rupture Hazard

   As indicated above, the East Great Salt Lake Fault is estimated to extend within approximately 2 miles west of the southwest edge of the property.

There is no surface evidence of the fault based on a reconnaissance of the area. The presence of the fault is based on seismic reflection surveys performed at the Great Salt Lake.

Based on the topography of the area, the East Great Salt Lake Fault would have relative movement down on the west. We would not anticipate shallow bedrock to be encountered on the west side of the fault. There is bedrock exposed west of the road on the west edge of the property. Based on this reasoning, the fault is located west of the road. The recent seismic reflection study would indicate that the East Great Salt Lake Fault is a considerable distance west of the road. Surface fault rupture is not considered a hazard at the site.

2. <u>Earthquake Ground Shaking</u>

   Ground shaking due to large earthquakes in the area is a potential hazard at the site. Studies performed by the U.S. Geological Survey would indicate that a probablistic ground motion of 0.55g would have a 2 percent probability of occurrence in a 50 year period (Frankel, et.al, 1996). The impact due to seismic ground shaking should be considered in the design of the facility.

3. <u>Landslide</u>

   There are no mapped landslides on the property based on a review of the landslide map of the Promontory Point 30 minute by 60 minute quadrangle (Harty, 1992). Some landslides are mapped north of the site in Little Valley.

   Based on a reconnaissance of the site and the subsurface conditions encountered in the test pits excavated at the site, landslide is not considered a hazard for the proposed development.

4. Debris Flow

There are no significant drainages which extend through the site and no source for debris flow upgradient of the site. Debris flow is not considered a hazard for the proposed development.

5. Rockfall

The source of rock for rockfall is steep rock outcrops at Lead Mountain to the northeast of the site and minor rock cliffs and bedrock outcrops in the southeast portion of the site. None of these rockfall sources are significant enough to pose a hazard for the proposed development.

6. Subsidence

The overburden soil at the site generally has low compressibility characteristics. The bedrock in the area consists predominantly of quartzite which has low solubility. The limestone which is present in the northeast portion of the site shows no evidence of caverns or other solution features of significance. A reconnaissance of the site found no evidence of depressions or other subsidence features. Subsidence due to dissolution of the limestone bedrock is not considered a potential hazard at the site.

7. Dam Failure Flooding

There are no dams upgradient of the site. Thus, dam failure flooding is not considered a hazard.

8. Mining Activity

The Promontory Mountains have been mined for lead in the past. There are mine prospects northeast of the site at and around Lead Mountain. Gravel and riprap for construction for the railroad causeway have been mined in the northwest portion of the property. There are some mine prospects in igneous dikes which cut through the Mutual Formation in the northwest portion of the site. Most mine prospects in the area appear to be shallow explorations with no evidence of significant underground mining due to the lack of mine spoil piles of significance. Two mine shafts were identified by the Utah Division of Oil, Gas and Mining in 1986 just east of the gravel quarries in the northwest portion of the site and designated VO-10 and VO-201 (see attached figure). These shafts were approximately 42 feet and 102 feet deep, respectively. Both shafts were filled in 1986. Mine related hazards are not considered a concern for the proposed development.

9. Salt Domes and Beds

Based on a reconnaissance of the site and subsurface exploration, there is no evidence for significant salt deposits on the property. Salt deposits are not expected with the type of bedrock encountered at the site. Salt domes and salt beds are not considered a hazard for the proposed development.

F. Conclusions

Based on our geologic hazard review for the project, seismic ground shaking represents the only geologic hazard identified as a potential concern for the proposed development. No other geologic features were identified which could compromise the structural integrity of the proposed facility.

RECOMMENDATIONS

Based on subsurface conditions encountered, the results of laboratory testing and our understanding of geologic conditions and the proposed construction, the following recommendations are given.

A. Site Grading

We anticipate that cuts will generally be on the order of 10 to 15 feet below the existing grade. We anticipate that there may be deeper cuts in areas with thicker overburden material. We anticipate that overburden material and/or excavated bedrock will be cut and stockpiled for use as drainage and soil cover materials. Processing of the on-site soil and bedrock will likely be needed to obtain suitable gradations for their intended use in constructing the landfill.

1. Excavation

Excavation of the overburden material, with the exception of highly cemented layers, can generally be accomplished with conventional excavation equipment. Highly cemented soil layers and excavations extending significant depths into the bedrock may require heavy-duty ripping and/or blasting.

Temporary unretained excavation slopes in the overburden material may be constructed at 1½ horizontal to 1 vertical or flatter. Temporary unretained excavation slopes in bedrock may be constructed at ½ horizontal to 1 vertical or flatter.

2. Subgrade Preparation

Prior to placing the geosynthetic clay liner, the subgrade should be cut to undisturbed, natural soil or bedrock. Loose or disturbed soil should be removed or compacted to at least 95 percent of the maximum dry density as determined by ASTM D-698. The moisture of the subgrade, where re-compacted, should be adjusted to within 2 percent of the optimum moisture content.

The subgrade should be relatively smooth prior to placing the geosynthetic clay liner. This may result in the need for some over-excavation and replacement with compacted fill where cobbles, boulders or significant irregularities in the bedrock are encountered.

3. Materials

The on-site soil and bedrock, which can be adequately broken down may be used in the construction.

We anticipate that on-site soils will be suitable for use as soil cover. Select on-site material or processed material could be used for drainage layers. Drainage material should have no more than 5 percent passing the No. 200 sieve.

4. Compaction

Materials placed in landfill foundation areas should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D-698. Protective soil cover should be compacted to at least 90 percent of the maximum dry density as determined by ASTM D-698. The fill should be compacted at a moisture content within 2 percent of the optimum moisture content to facilitate the compaction process.

Care will be required when placing soil cover and drainage materials over the membrane liners. Adequate thickness of soil should be placed over the liners prior to using equipment above the liner. The size of equipment should be restricted so as not to damage the liner.

B. Stability

1. Short Term - During Operation

We understand that landfill lining systems will be constructed on cut slopes of 3 horizontal to 1 vertical and waste placed over these areas. Stability of these slopes should be maintained by extending the waste and cover materials out laterally a sufficient distance beyond the toe of the slopes during construction and operation.

The friction angle between components of the lining system should be considered in establishing the criteria for waste placement on the slopes.

2. Long Term - Closure

We understand that the exterior slope of the proposed landfill will have a final slope of 4 horizontal to 1 vertical. Stability analysis was conducted assuming the municipal solid waste to have a friction angle of 25 degrees (Singh and Murphy, 1990). We have assumed that friction angles between components of the closure cap will be at least 25 degrees or more. The friction angles between components of the closure cap should be verified and considered in the design.

An infinite slope method of analysis was used. Under static conditions, the analysis indicates a safety factor of 1.9.

A pseudo-static analysis was conducted using a peak horizontal ground acceleration of 0.55g for a seismic event having a 2 percent probability of exceedance in a 50 year period (10 percent in 250 years) and estimating deformation due to ground shaking. The results of the analysis indicate a small to moderate displacement is likely under this seismic condition with predicted movement on the order of 15 cm for a 4 horizontal to 1 vertical slope.

The analysis conducted is a screening analysis presented by Bray, et al., 1998, from "Simplified Seismic Design Procedure for Geosynthetic-Lined Solid-Waste Landfills". A 50 percent confidence threshold was used (Blake, T.F., et al., 2002).

Protection from erosion will be important for maintaining long term stability of the closure. We understand that drainage and erosion protection are being addressed by the design civil engineer.

Results of the stability analysis are included in the Appendix.

C. Settlement

Settlement calculations were conducted for overburden soil based on the anticipated closure with 4 horizontal to 1 vertical slopes and assuming 10 feet of material is excavated and removed. Contours representing the calculated settlement are presented on Figure 26.

The settlement does not include bedrock strain. We estimate bedrock strain under the load of the landfill to be on the order of 0 to 6 inches.

Settlement calculations are included in the Appendix.

LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering and geology practices in the area for the use of the client for design purposes. The information presented is based on the review of geologic literature, excavation of test pits at the approximately locations indicated on Figure 2, subsurface conditions encountered in drilling for five monitor wells at the approximate locations indicated on Figure 2 and the results of laboratory testing. Variations in the subsurface materials may not become evident until additional exploration or excavation is conducted. If the proposed construction or subsurface conditions are significantly different from those described above, we should be notified so that we can reevaluate our recommendations.

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JRM:DRH/dc

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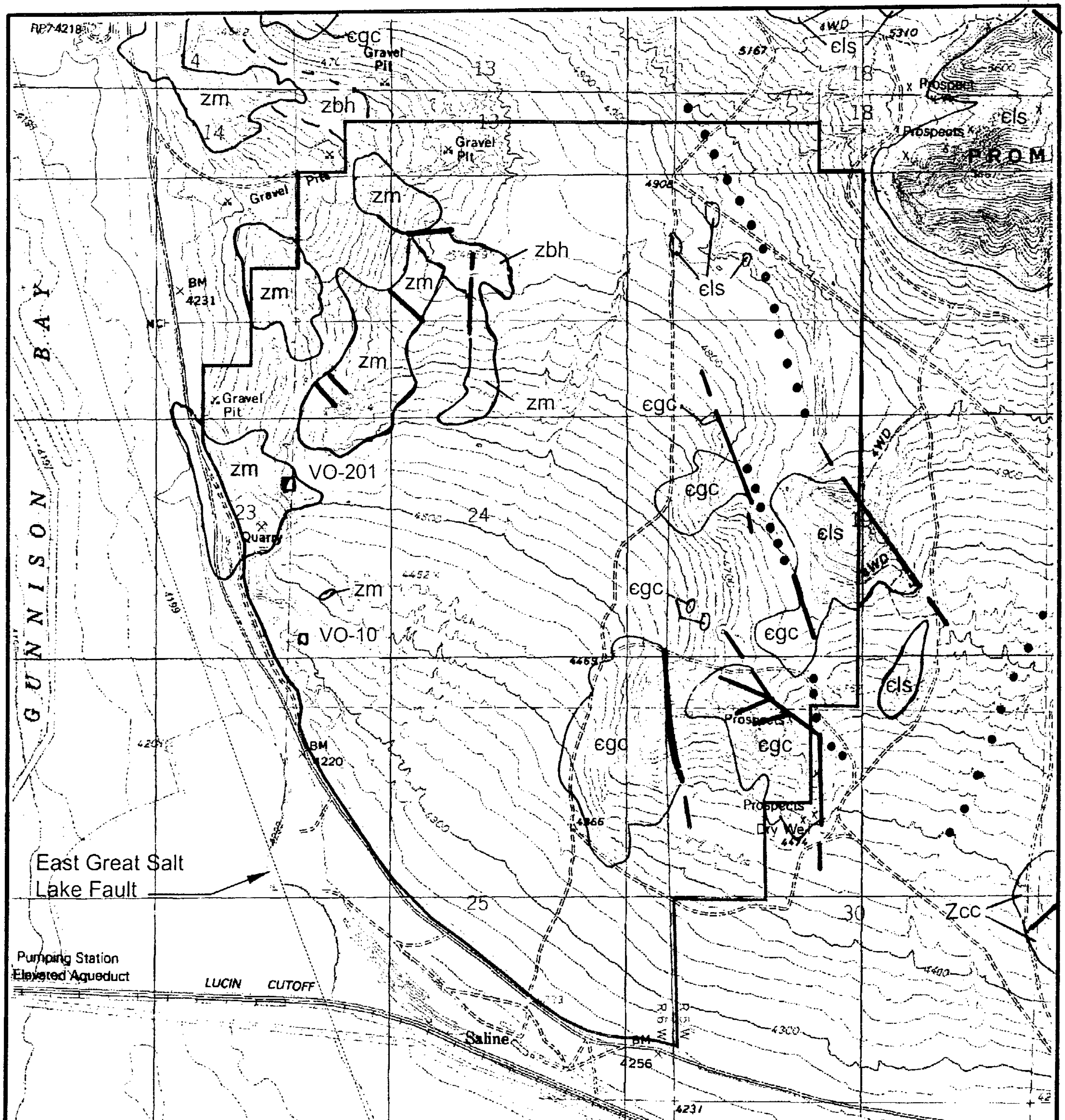


Topographic base from USGS Promontory Point and Pokes Point Quadrangles.
Geology from Crittenden, 1988.

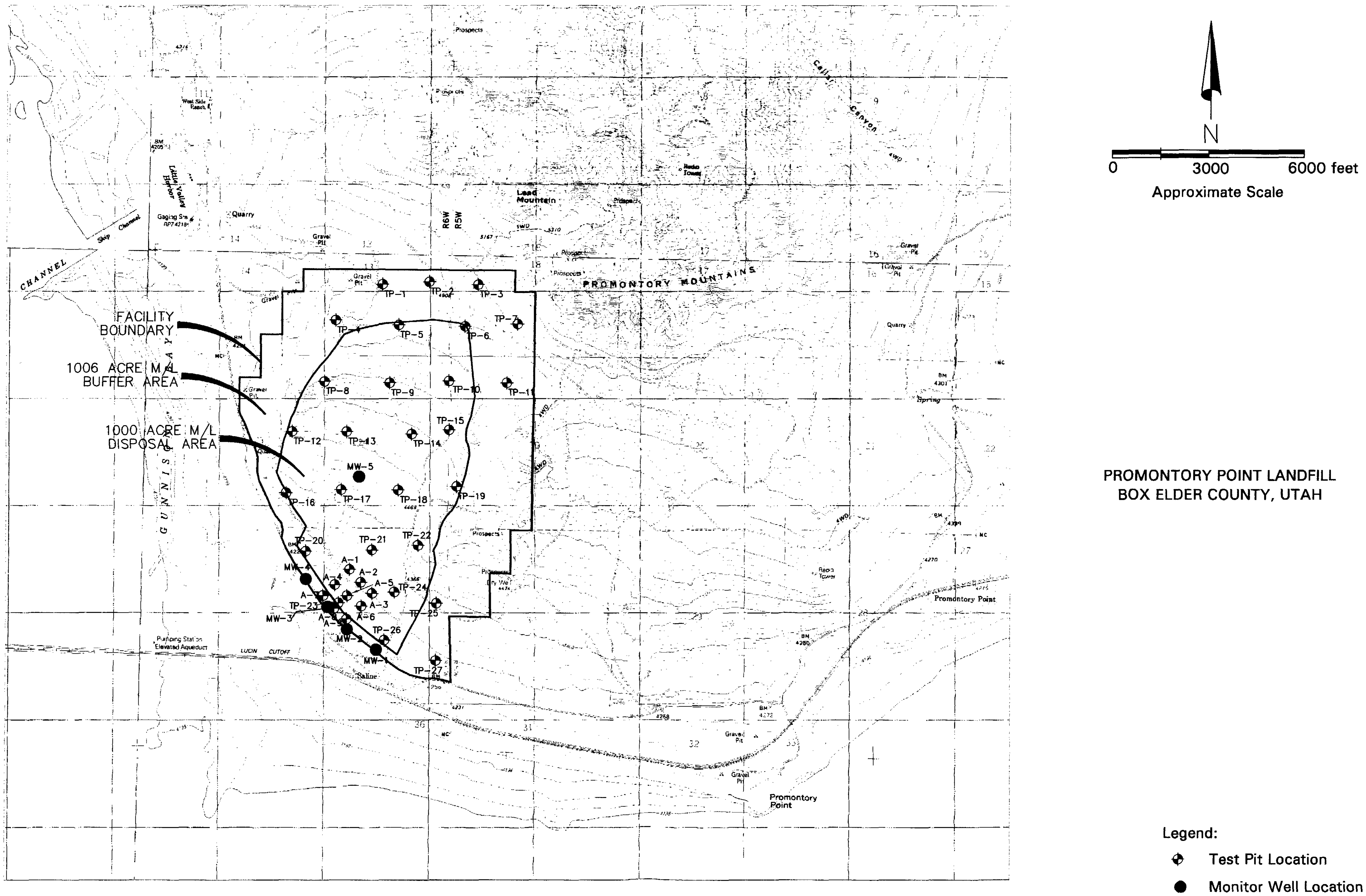
Promontory Landfill Site
Box Elder County, Utah

N

Approximate Scale
1 inch = 2,000 feet

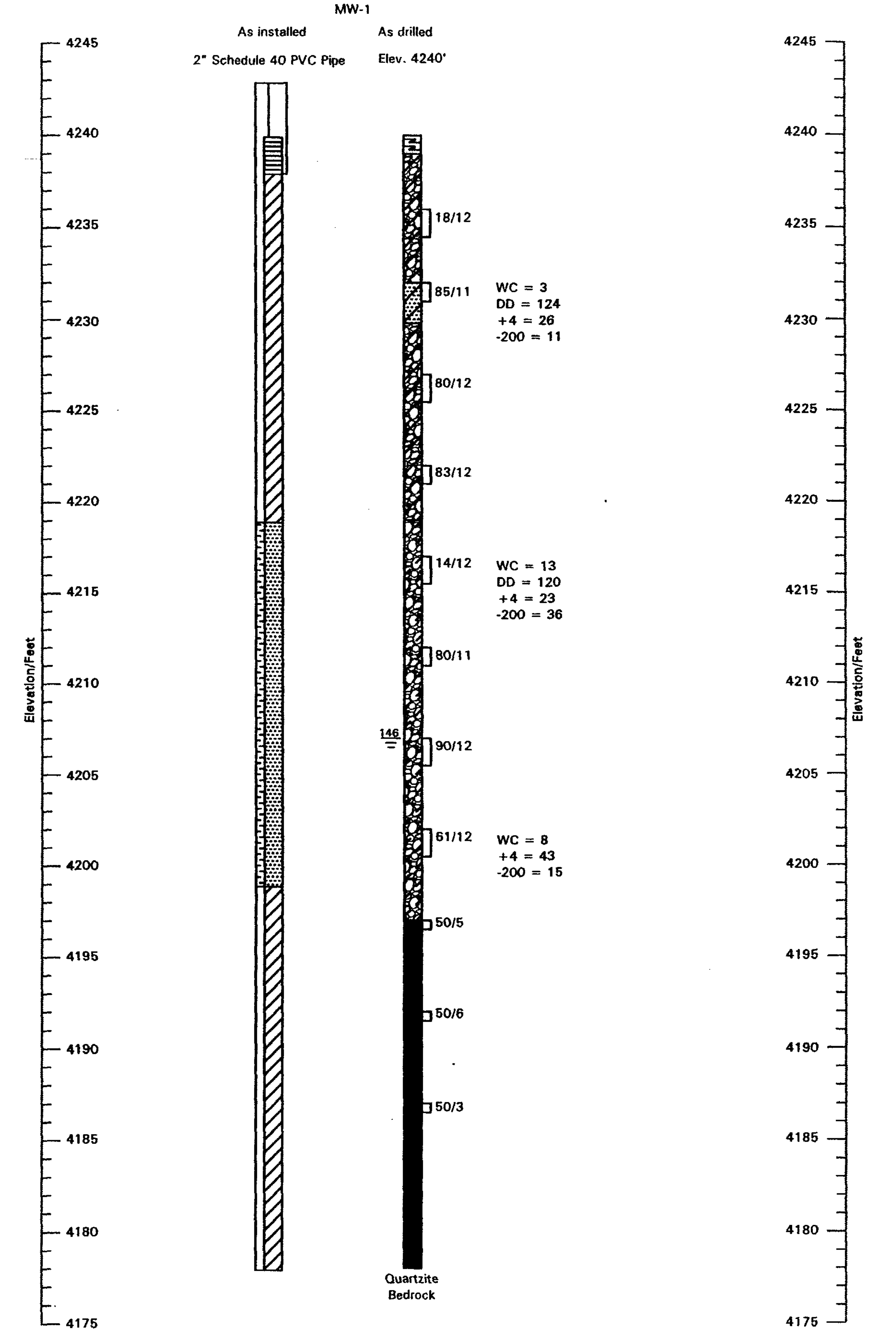
Legend:
ɛls - Limestone and Shale (middle and lower Cambrain)
ɛgc - Geertsen Canyon Quartzite (lower Cambrain)
zbh - Browns Hole Formation (late Proterozoic)
zm - Mutual Formation (late Proterozoic)
——— Contact
—··· Fault
☐ VO-201 Mine Shaft filled

1020875	AGEC	Geologic Map	Figure 1



PROMONTORY POINT LANDFILL
BOX ELDER COUNTY, UTAH

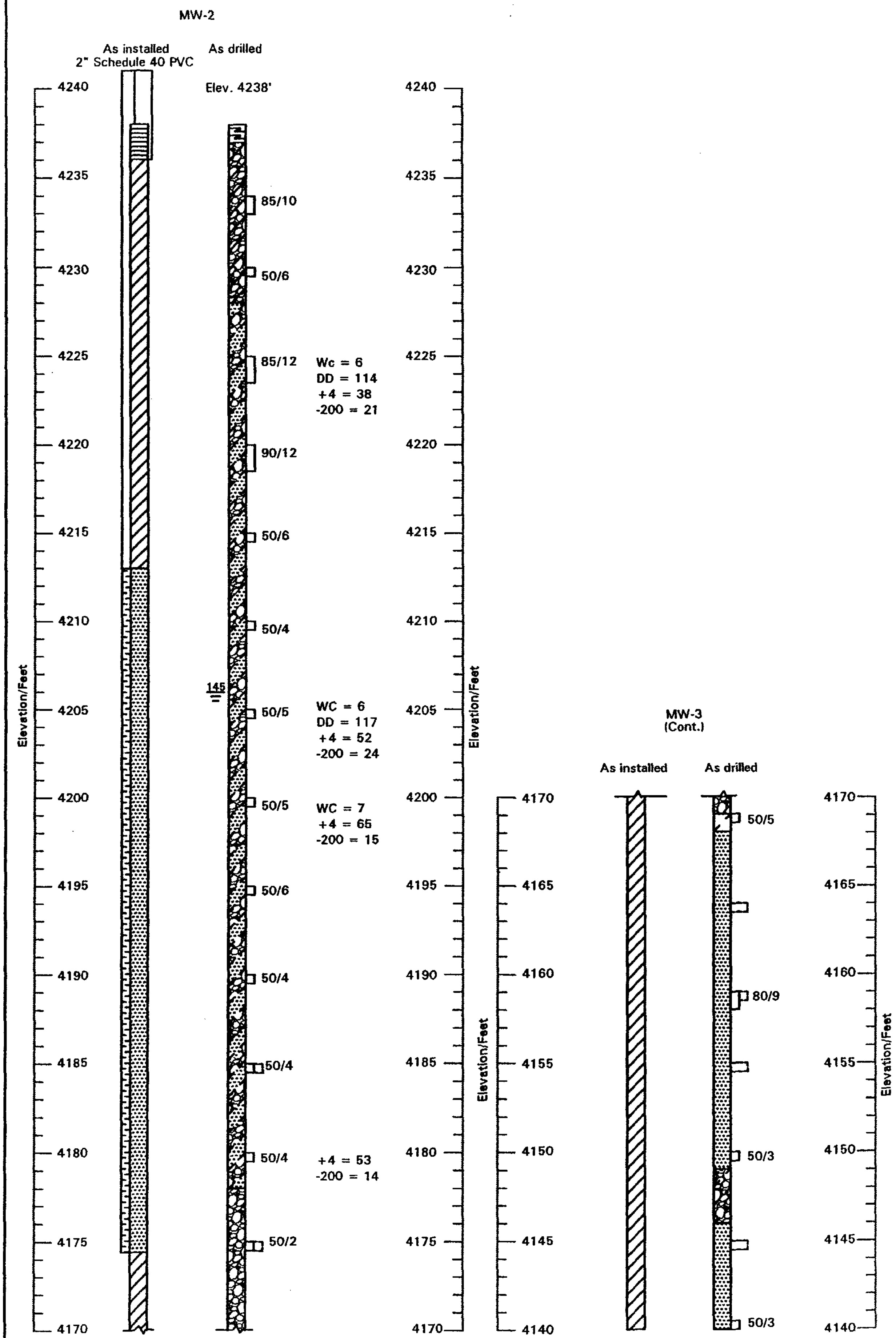
1020875	AGEC	Locations of Monitor Wells and Test Pits	Figure 2



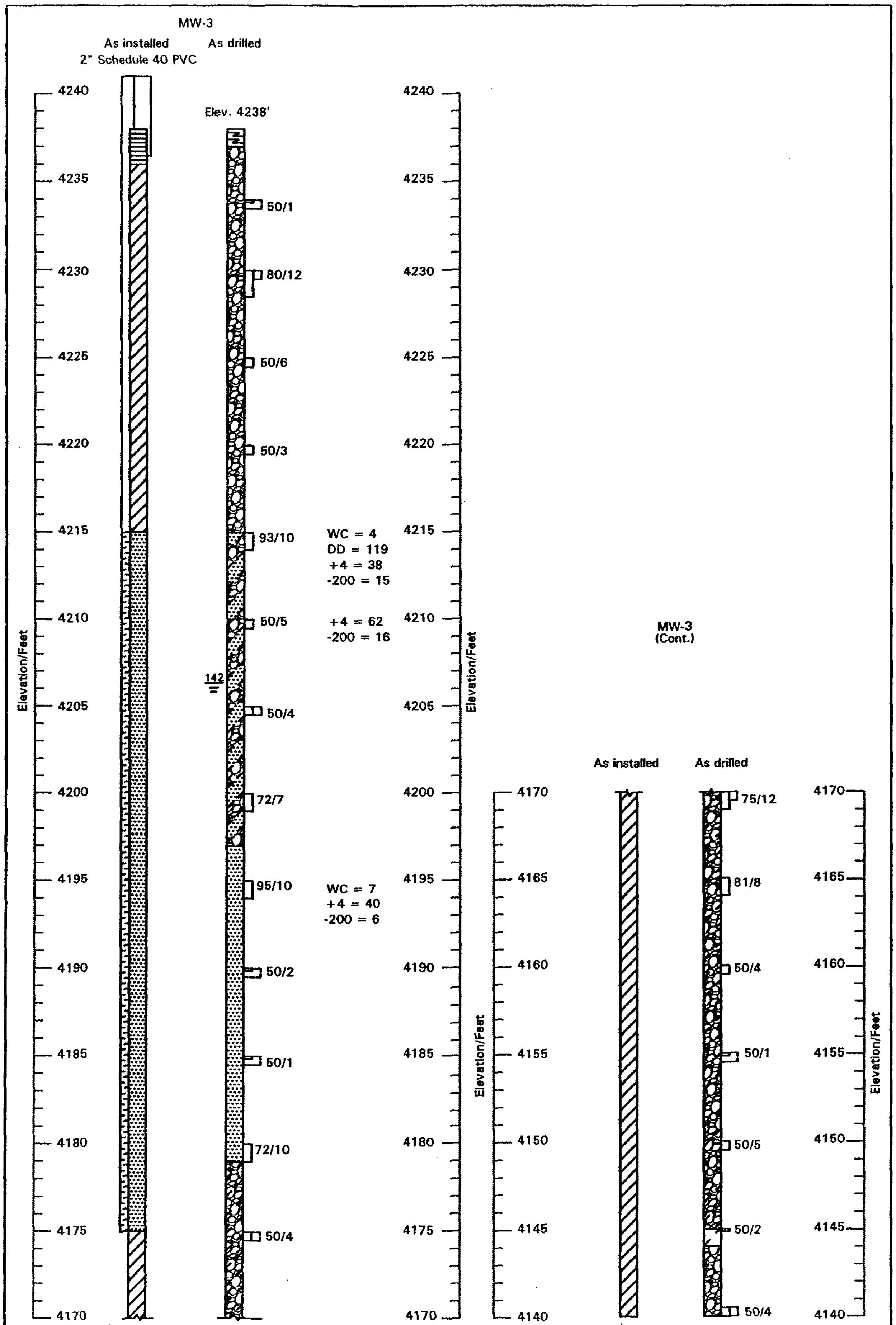
Approximate Vertical Scale 1" = 8'

See Figure 13 for Legend and Notes

1020875	AGEC	Log of Monitor Well MW-1	Figure 3



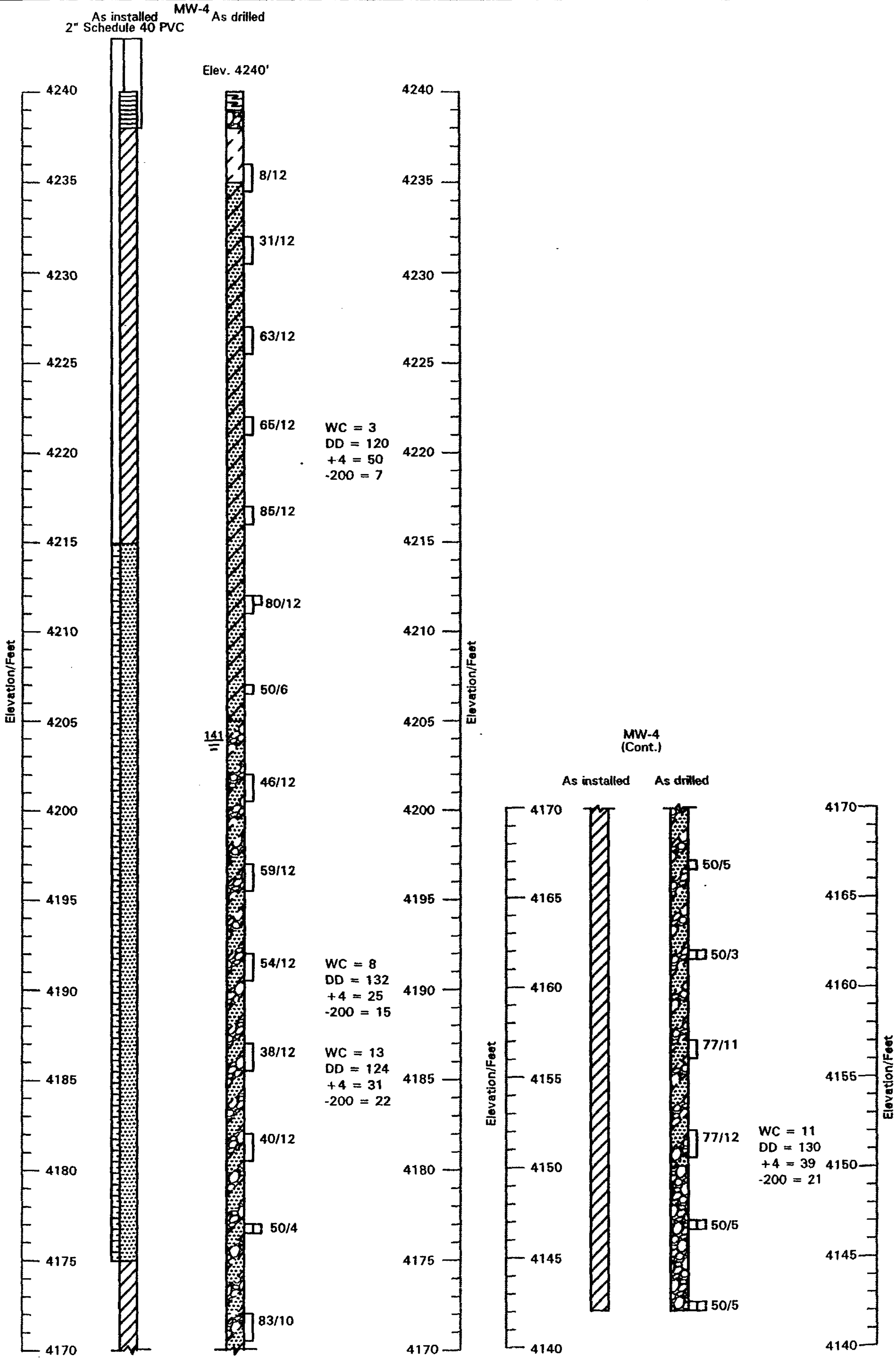
MW-2
As installed
2" Schedule 40 PVC
As drilled
Elev. 4238'
Elevation/Feet
4240
4235
4230
4225
4220
4215
4210
4205
4200
4195
4190
4185
4180
4175
4170
85/10
50/6
85/12
Wc = 6
DD = 114
+4 = 38
-200 = 21
90/12
50/6
50/4
145
50/5
WC = 6
DD = 117
+4 = 52
-200 = 24
50/5
WC = 7
+4 = 65
-200 = 15
50/6
50/4
50/4
50/4
+4 = 53
-200 = 14
50/2
MW-3
(Cont.)
As installed
As drilled
4170
4165
4160
4155
4150
4145
4140
50/5
80/9
50/3
50/3
Approximate Vertical Scale 1" = 8'
See Figure 13 for Legend and Notes



Approximate Vertical Scale 1" = 8'

See Figure 13 for Legend and Notes

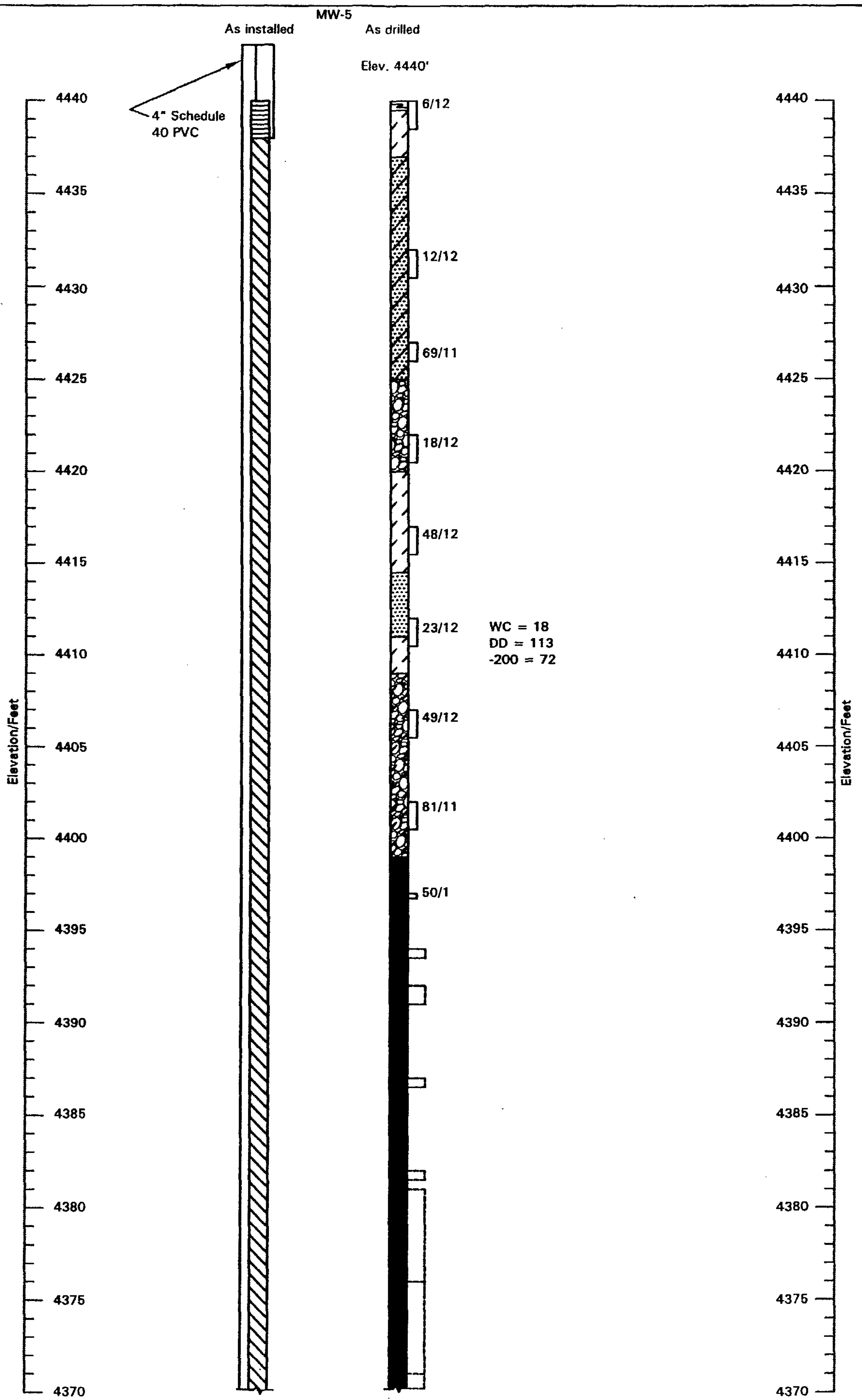
1020875	AGRA	Log of Monitor Well MW-3	Figure 5



Approximate Vertical Scale 1" = 8'

See Figure 13 for Legend and Notes

1020875	AGEC	Log of Monitor Well MW-4	Figure 6



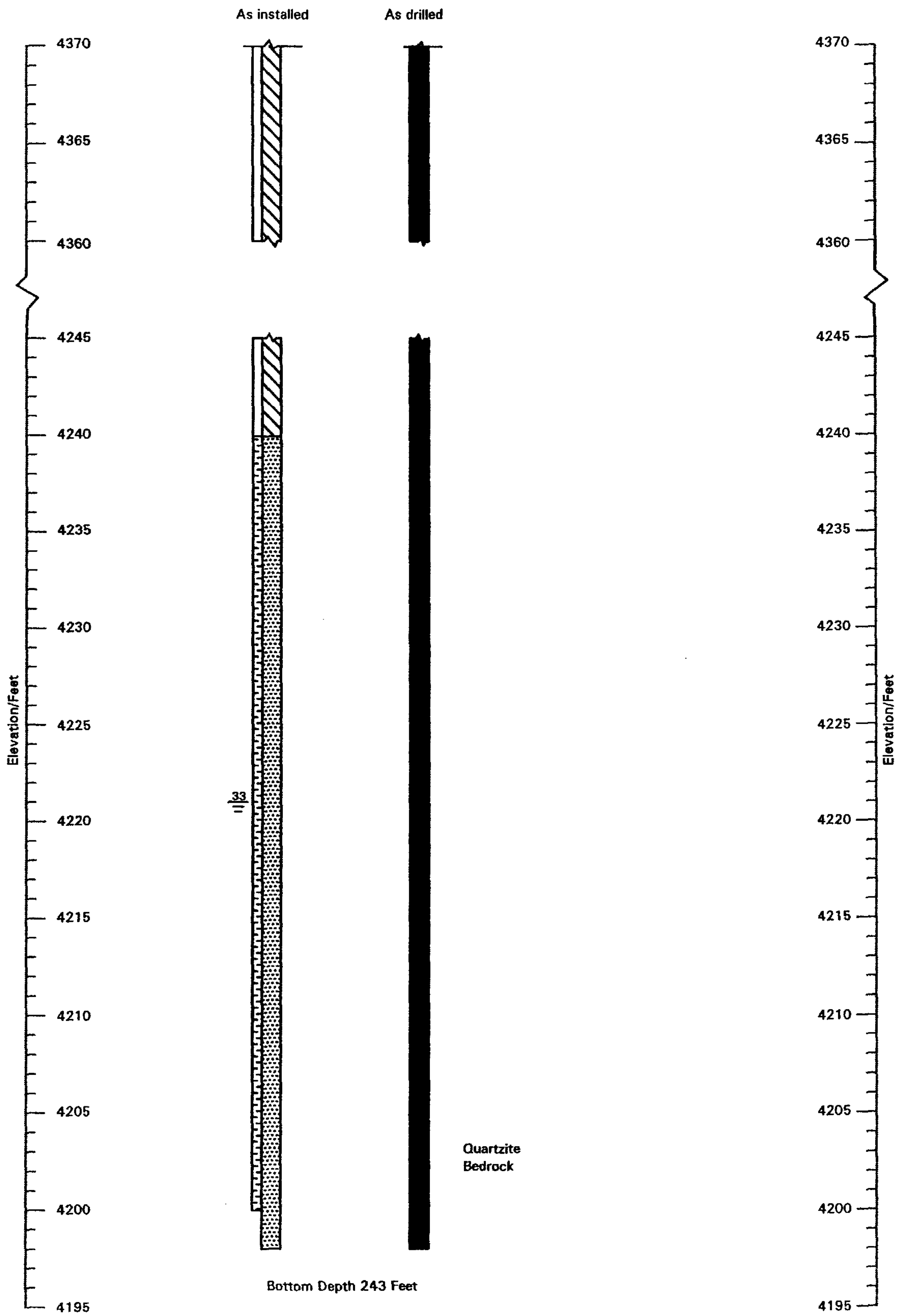
Approximate Vertical Scale 1" = 8'

Continued on next figure

See Figure 13 for Legend and Notes

1020875 | AGES | Log of Monitor Well MW-5 | Figure 7

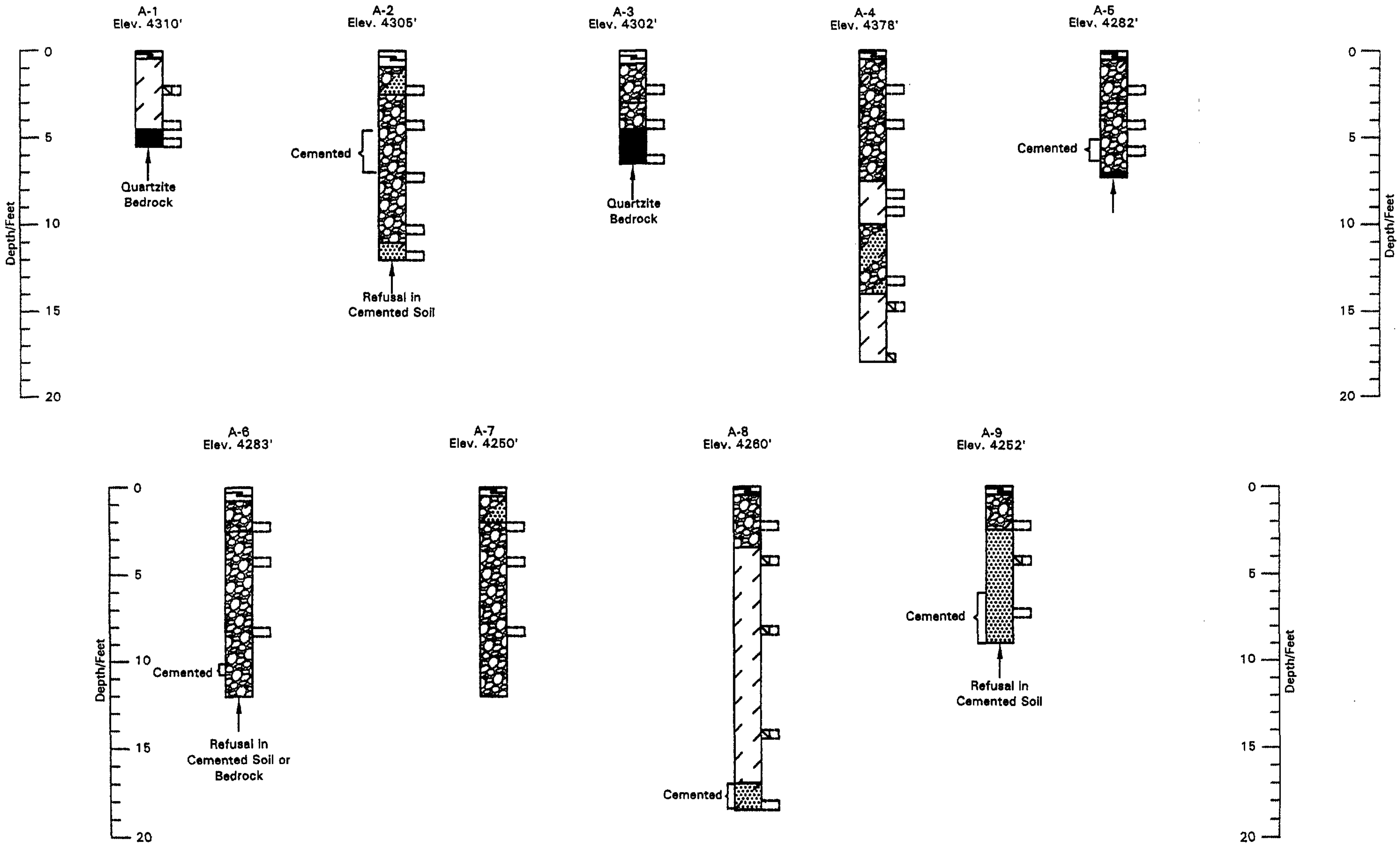
MW-5 (Continued)



Approximate Vertical Scale 1" = 8'

See Figure 13 for Legend and Notes

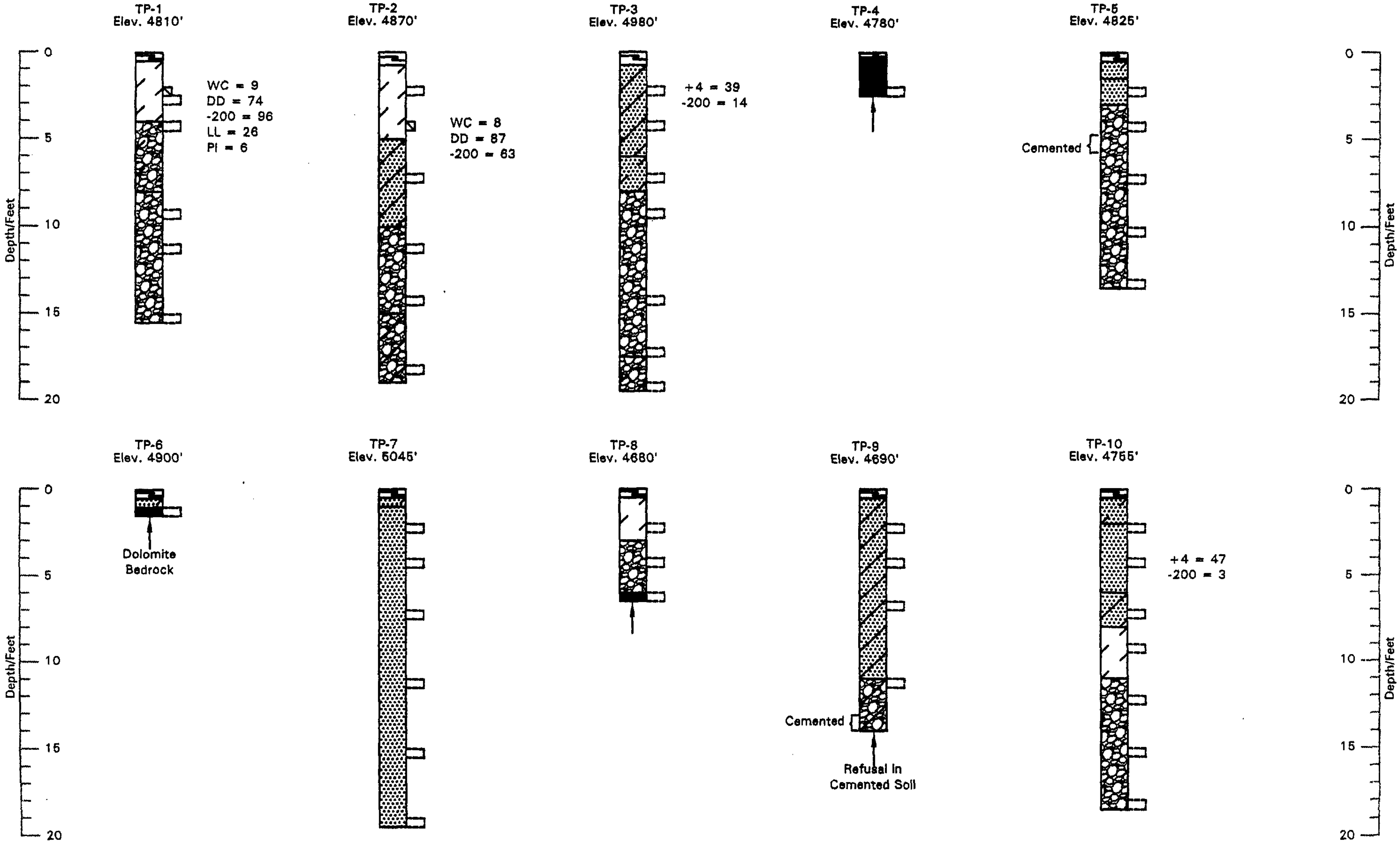
1020875	ARES	Log of Monitor Well MW-5	Figure 8



Approximate Vertical Scale 1" = 8'

See Figure 13 for Legend and Notes

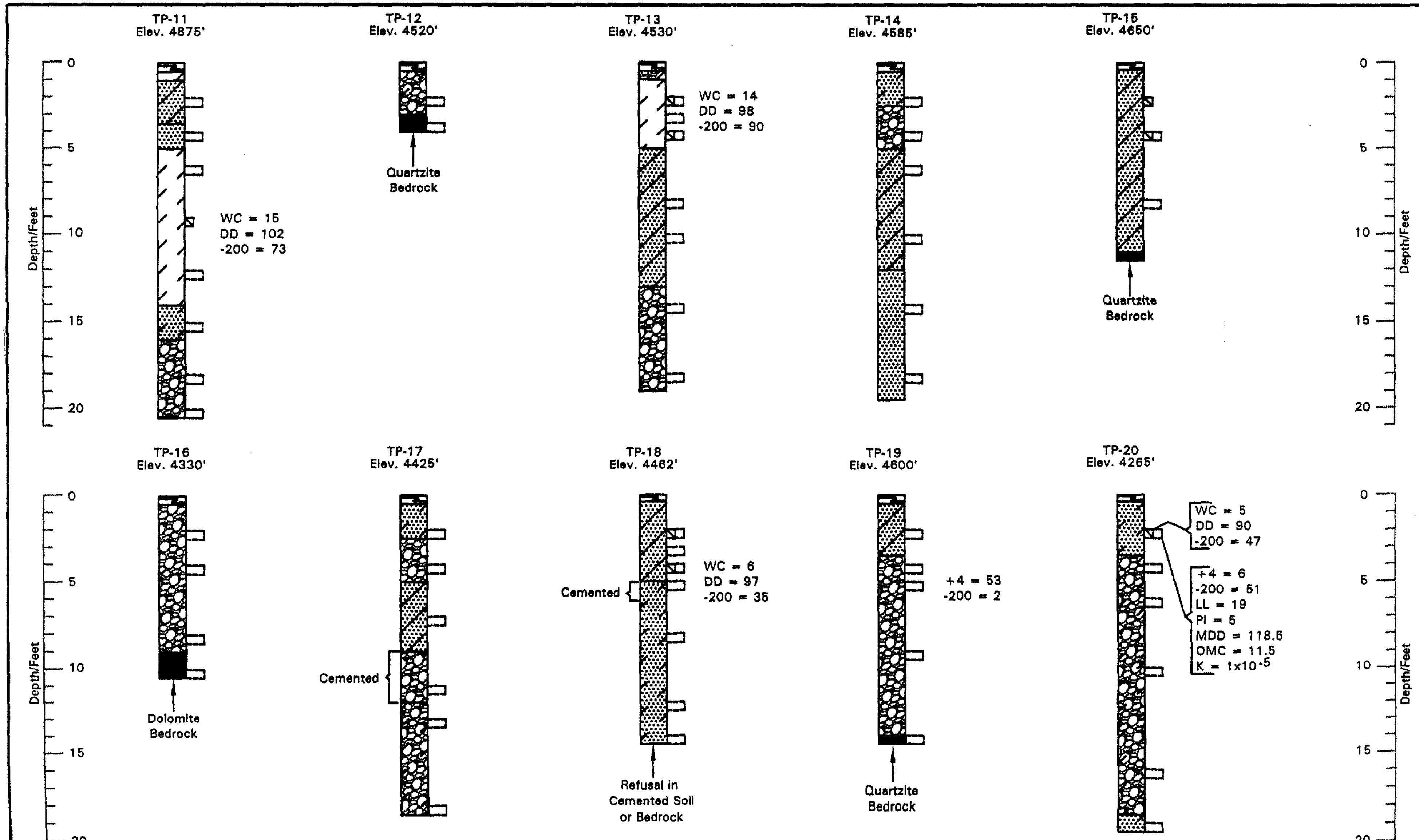
1020875	AGRA	Logs of Test Pits	Figure 9



Approximate Vertical Scale 1" = 8'

See Figure 13 for Legend and Notes

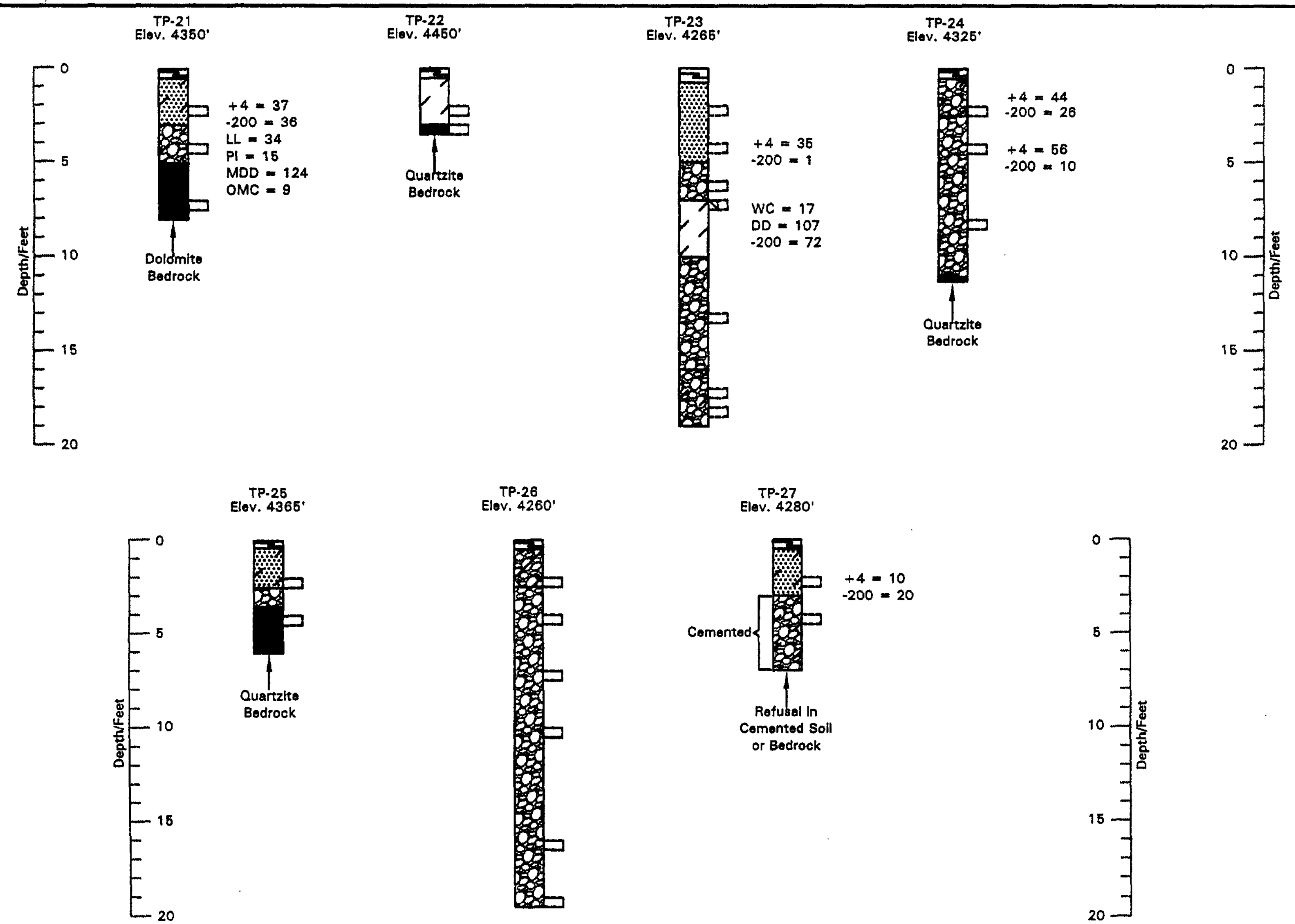
1020875	AGEC	Logs of Test Pits	Figure 10



Approximate Vertical Scale 1" = 8'

See Figure 13 for Legend and Notes

1020875	AGEC	Logs of Test Pits	Figure 11



Approximate Vertical Scale 1" = 8'

See Figure 13 for Legend and Notes

1020875	AGEC	Logs of Test Pits	Figure 12

Legend of Boring and Test Pit Logs:

Topsoil; silty and clayey sand and gravel to lean clay, cobbles and occasional boulders, slightly moist, brown, roots.

Lean Clay (CL); small to moderate amount of gravel, porous in Test Pits TP-1, TP-2 and A-1, cobbles and occasional boulders up to 3 feet in size, stiff to very stiff, slightly moist, wet at depth in borings, brown to reddish brown to grayish brown.

Clayey Sand with Gravel (SC); clayey gravel layers, cobbles and occasional boulders up to 1 ½ feet in size, medium dense to dense, slightly moist to moist, brown.

Silty Sand with Gravel (SM); clayey layers and gravel layers, occasional cemented layers, cobbles and occasional boulders, medium dense to very dense, slightly moist, brown to reddish brown.

Poorly Graded Sand with Gravel (SP); gravel layers, cobbles and occasional boulders, occasional cemented layers, medium dense to very dense, slightly moist to moist, wet at depth in the borings, brown to grayish brown to reddish brown.

Clayey Gravel with Sand and Clayey Sand with Gravel (GC/SC); interlayered, cobbles and occasional boulders, occasional clay layers, dense to very dense, slightly moist to moist, wet at depth in the borings, brown to gray.

Clayey Gravel with Sand (GC); clayey sand layers, occasional clay layers, cobbles and boulders up to approximately 2 feet in size, occasional cemented layers, medium dense to very dense, slightly moist to moist, wet at depth in the borings, brown to gray.

Silty Gravel with Sand (GM); silty sand layers, cobbles up to approximately 1 foot in size, occasional cemented layers, dense to very dense, slightly moist, brown.

Poorly Graded Gravel with Sand (GP); sand layers, occasional cemented layers, cobbles and boulders up to approximately 2 feet in size, medium dense to very dense, slightly moist to moist, wet at depth in the borings, brown to grayish brown.

Bedrock; quartzite and dolomite, hard to very hard, dry to wet, grayish white to gray to purple.

10/12 California Drive sample taken. The symbol 10/12 indicates that 10 blows from a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.

Indicates relatively undisturbed hand drive sample taken.

Indicates disturbed sample taken.

Indicates practical refusal.

Indicates the depth of subsurface water and the number of days after drilling the measurement was taken.

NOTES:

1. The borings for monitor wells MW-1 to MW-4 were drilled and installed on January 23, 24, 27, 28 and 29, 2003 with a 4 inch odex drilling system. Monitor well MW-5 was drilled and installed May 14 to May 21, 2003 with 8-inch Odex/Air Rotory methods. The test pits were excavated on December 11, 12, 13, 16 and 23, 2002 with a track excavator.
2. Locations of the borings and test pits were measured approximately by a hand-held GPS.
3. Elevations of the borings and test pits were estimated based on interplation between contours shwon on Figure 2.
4. The boring and test pit locations and elevations should be considered accurate only to the degree implied by the method used.
5. The lines between the materials shown on the boring and test pit logs represent the approximate boundaries between material types and the transitions may be gradual.
6. No free water was encountered in the test pits at the time of excavating. Water level readings shown on the monitor well logs were made at the time and under the conditions indicated. Fluctuation in the water level will occur with time.
7. WC = Water Content (%);
   DD = Dry Density (pcf);
   +4 = Percent Retained on No. 4 Sieve;
   -200 = Percent Passing No. 200 Sieve;
   LL = Liquid Limit (%);
   PI = Plasticity Index (%);
   MDD = Maximum Dry Density determined by ASTM D-678 (pcf);
   OMC = Optimum Moisture Content determined by ASTM D-678 (%);
   K = Permeability (cm/sec).

LEGEND OF WELL INSTALLATION:

Concrete.

Bentonite Seal (3/8" chips).

Bentonite Grout.

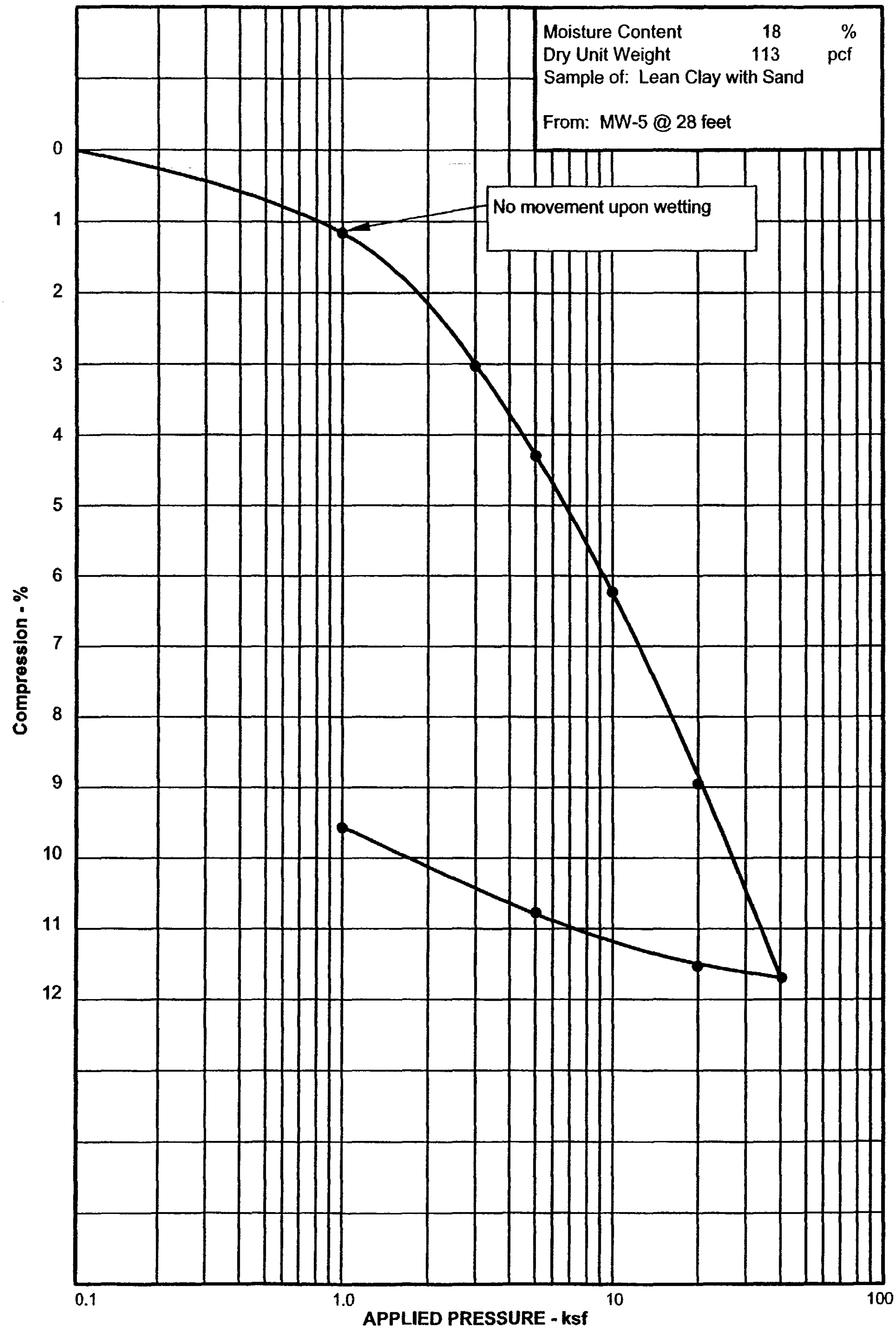
Sand pack around well screen. 10-20 Silica Sand.

Indicates Schedule 40 PVC flush threaded pipe installed.

Indicates machine slotted schedule 40 PVC flush treaded pipe with 0.01 inch openings installed.

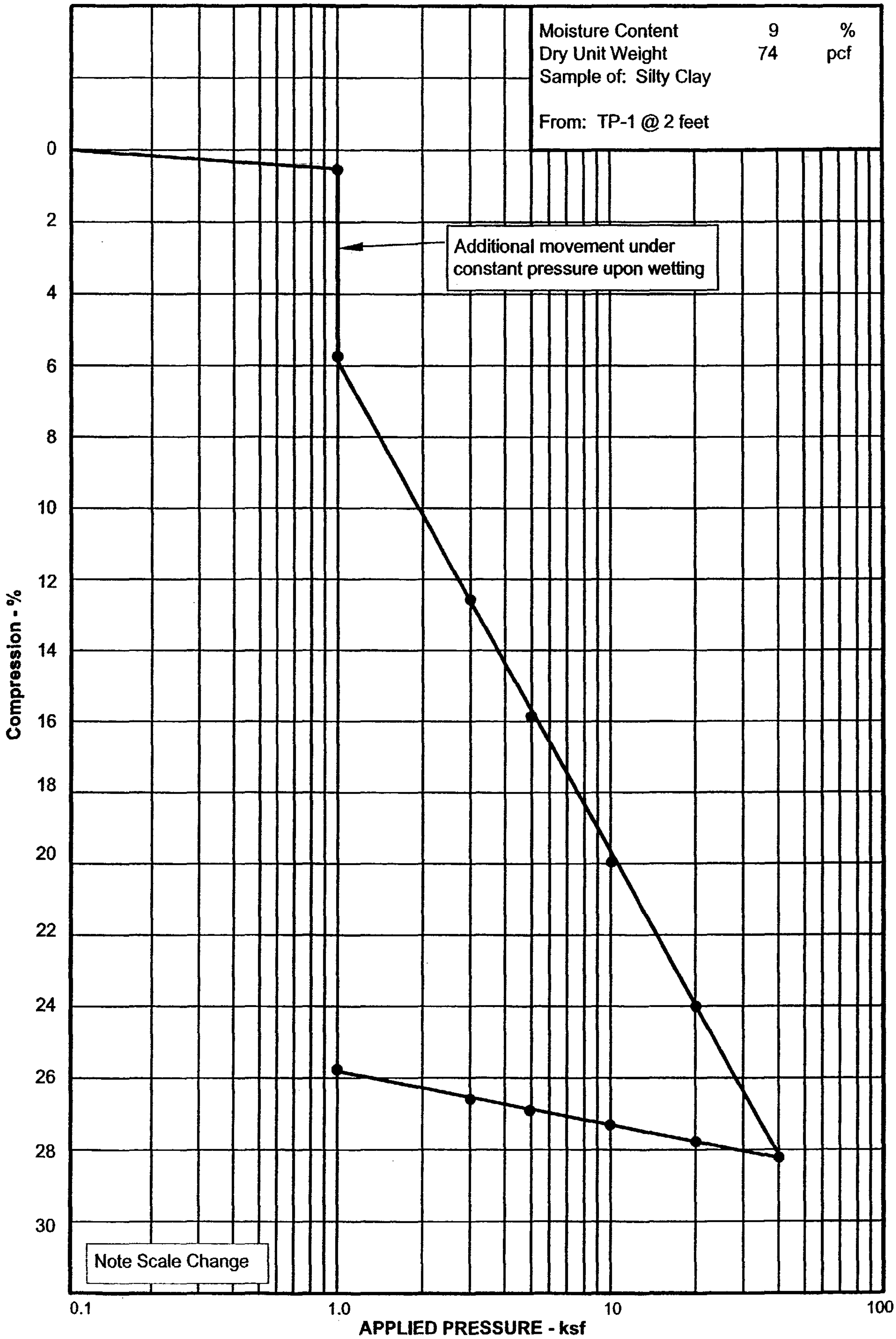
Indicates steel protective casing installed. The casings are 4 inch diameter for MW-1 through MW-4. The casing is 8 inch square for MW-5.

Applied Geotechnical Engineering Consultants, Inc.



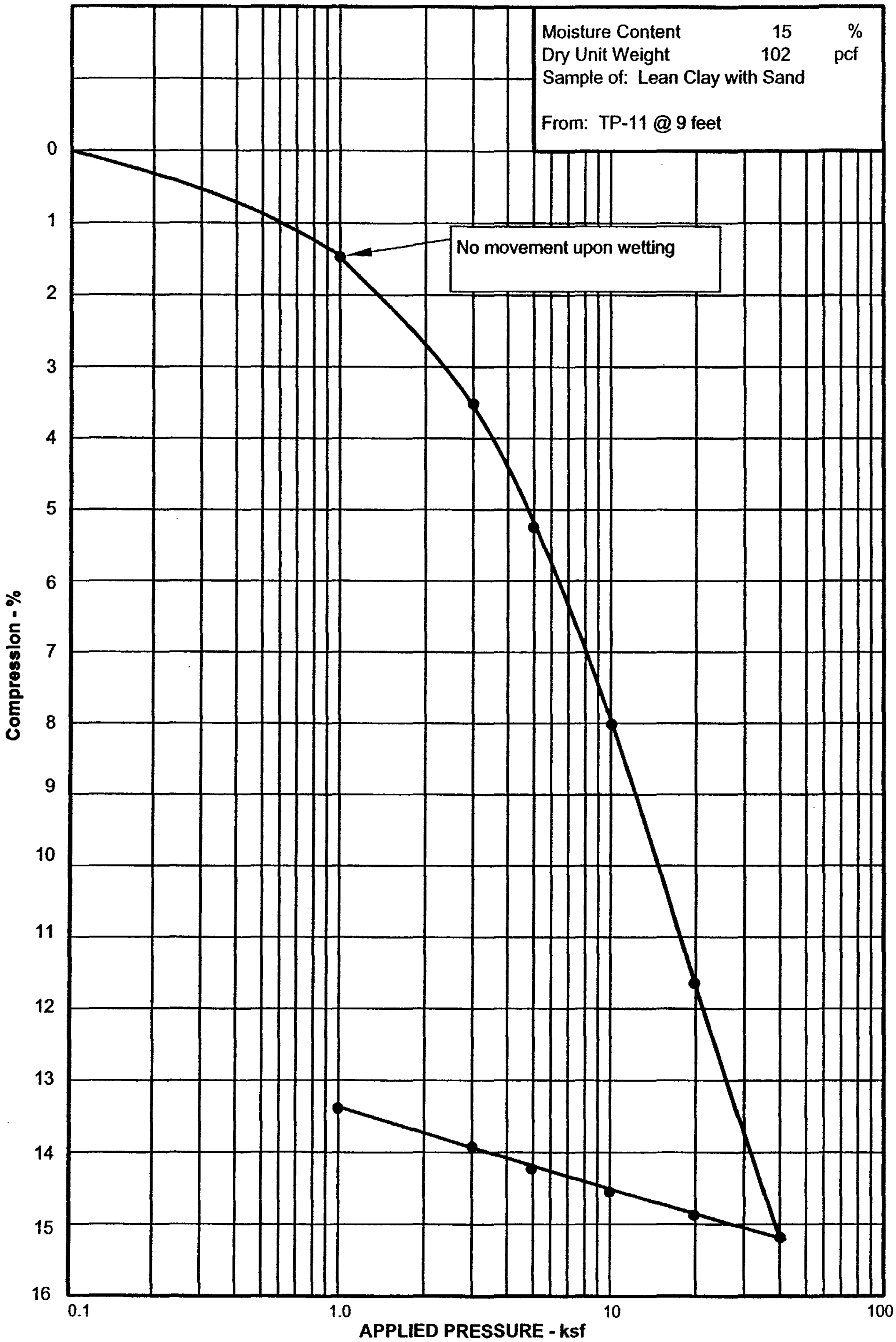
1020875 **CONSOLIDATION TEST RESULTS** **Figure 14**

Applied Geotechnical Engineering Consultants, Inc.

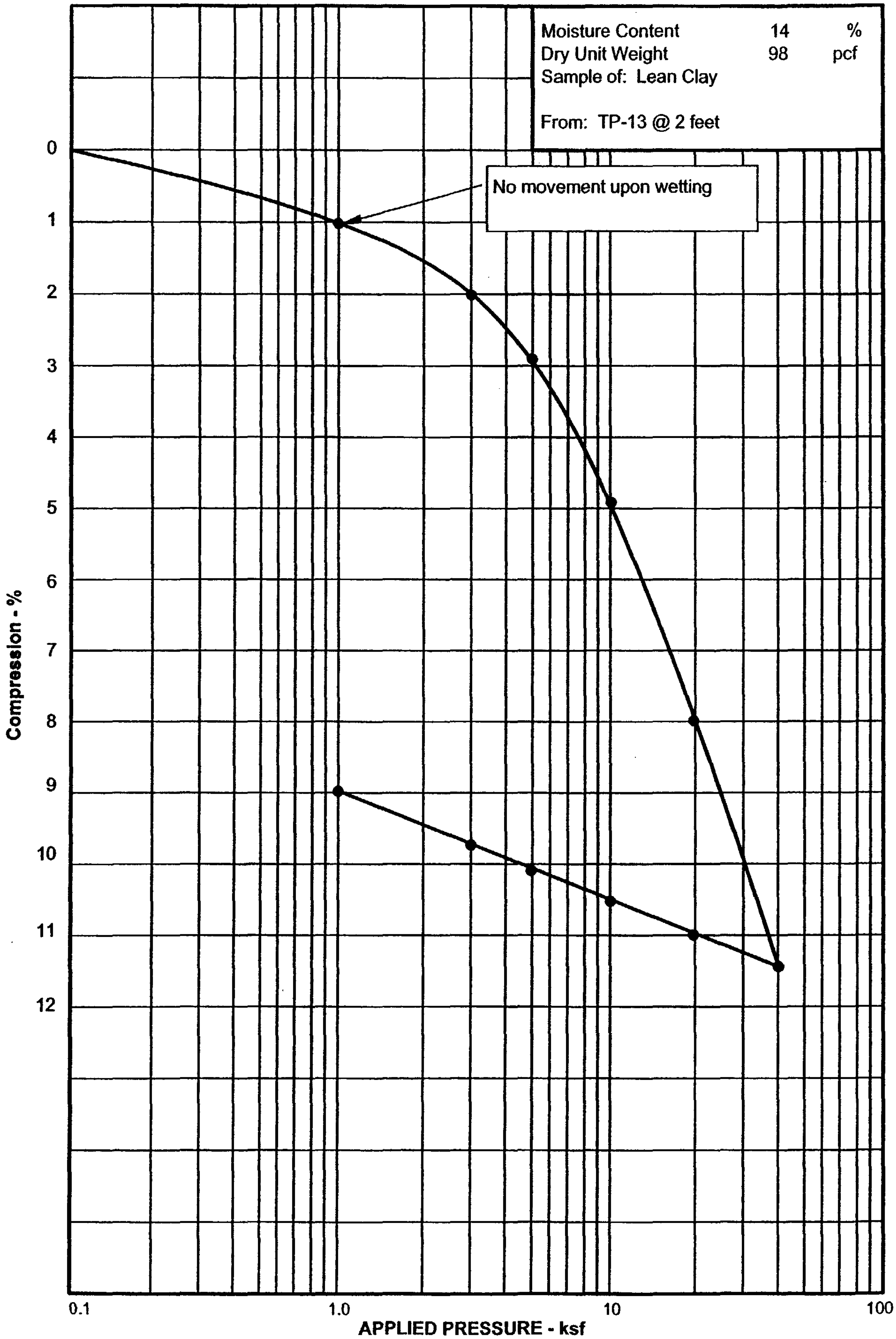


1020875 **CONSOLIDATION TEST RESULTS** **Figure 15**

Applied Geotechnical Engineering Consultants, Inc.

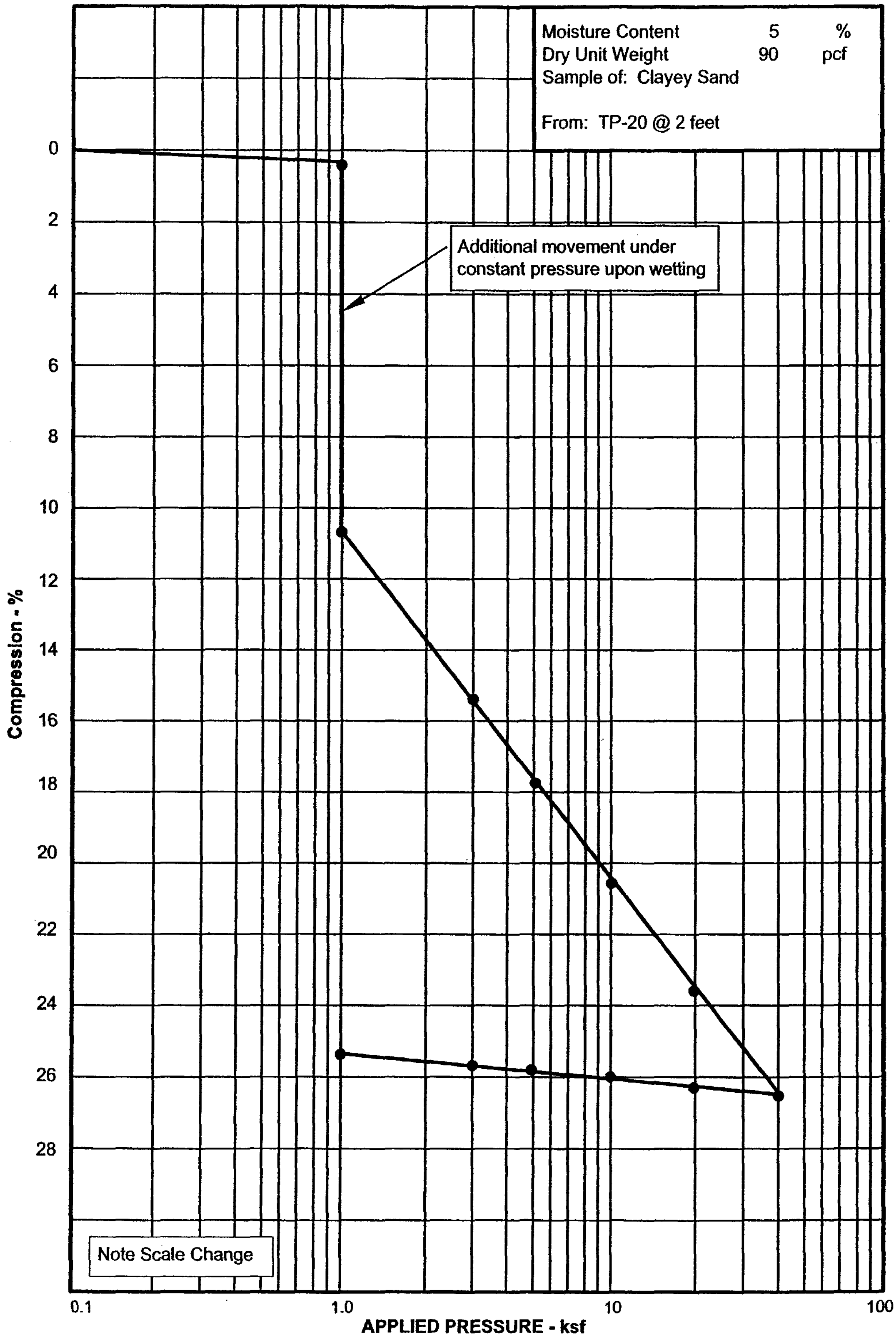


Applied Geotechnical Engineering Consultants, Inc.



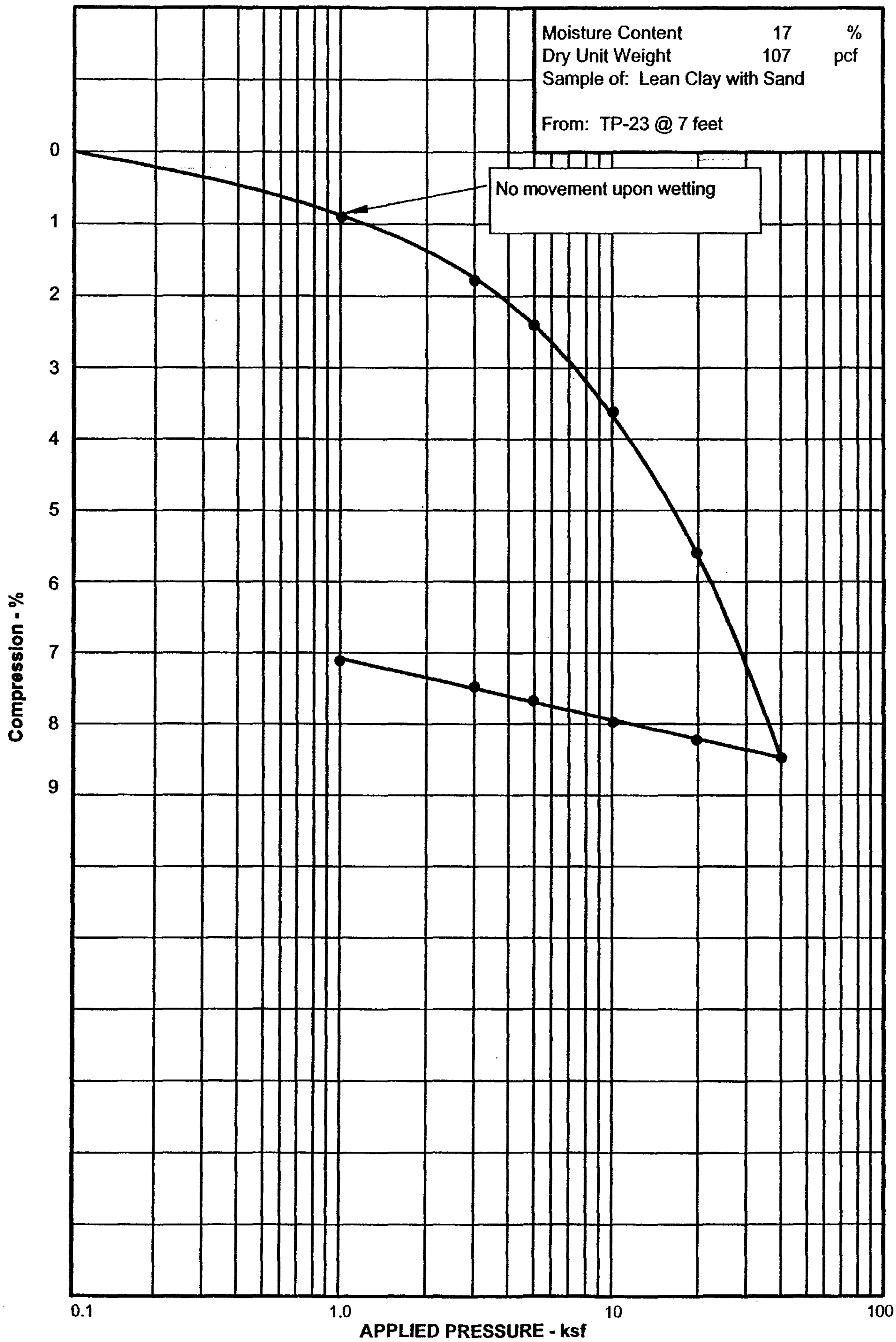
1020875 **CONSOLIDATION TEST RESULTS** **Figure 17**

Applied Geotechnical Engineering Consultants, Inc.



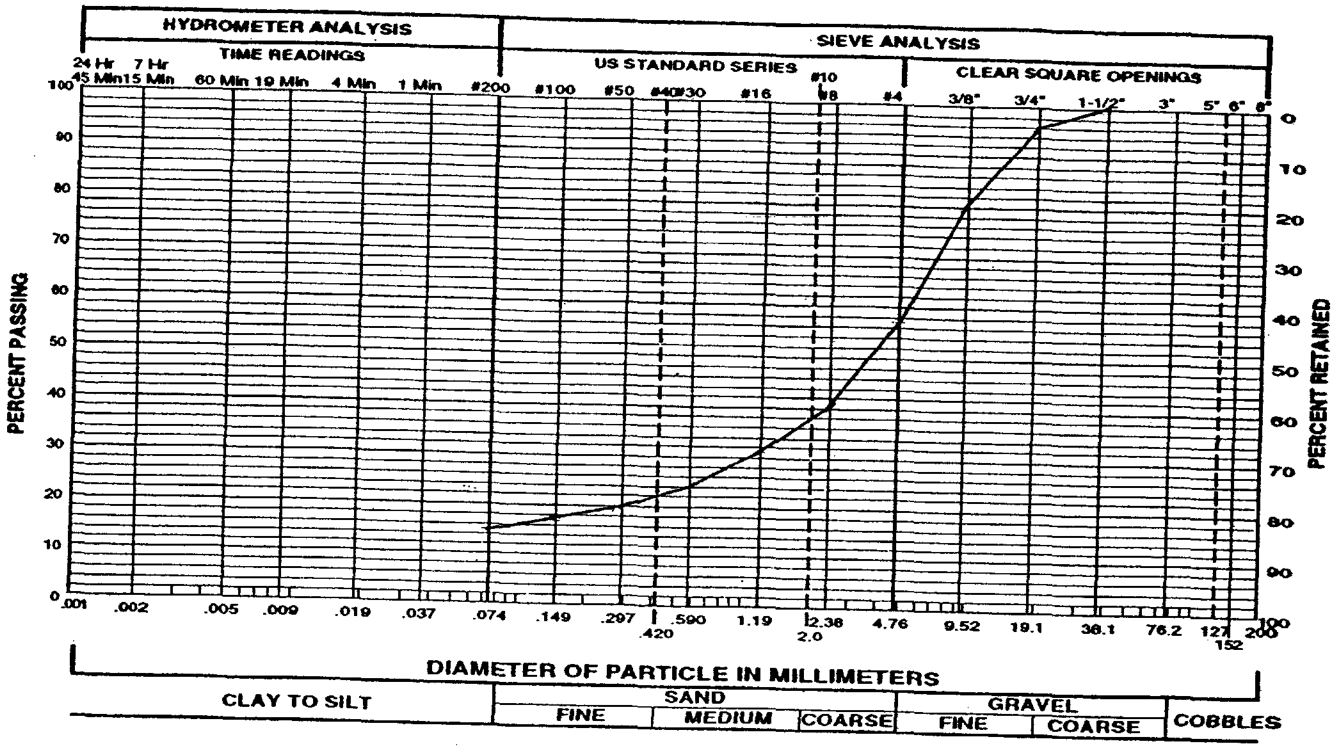
1020875 **CONSOLIDATION TEST RESULTS** **Figure 18**

Applied Geotechnical Engineering Consultants, Inc.

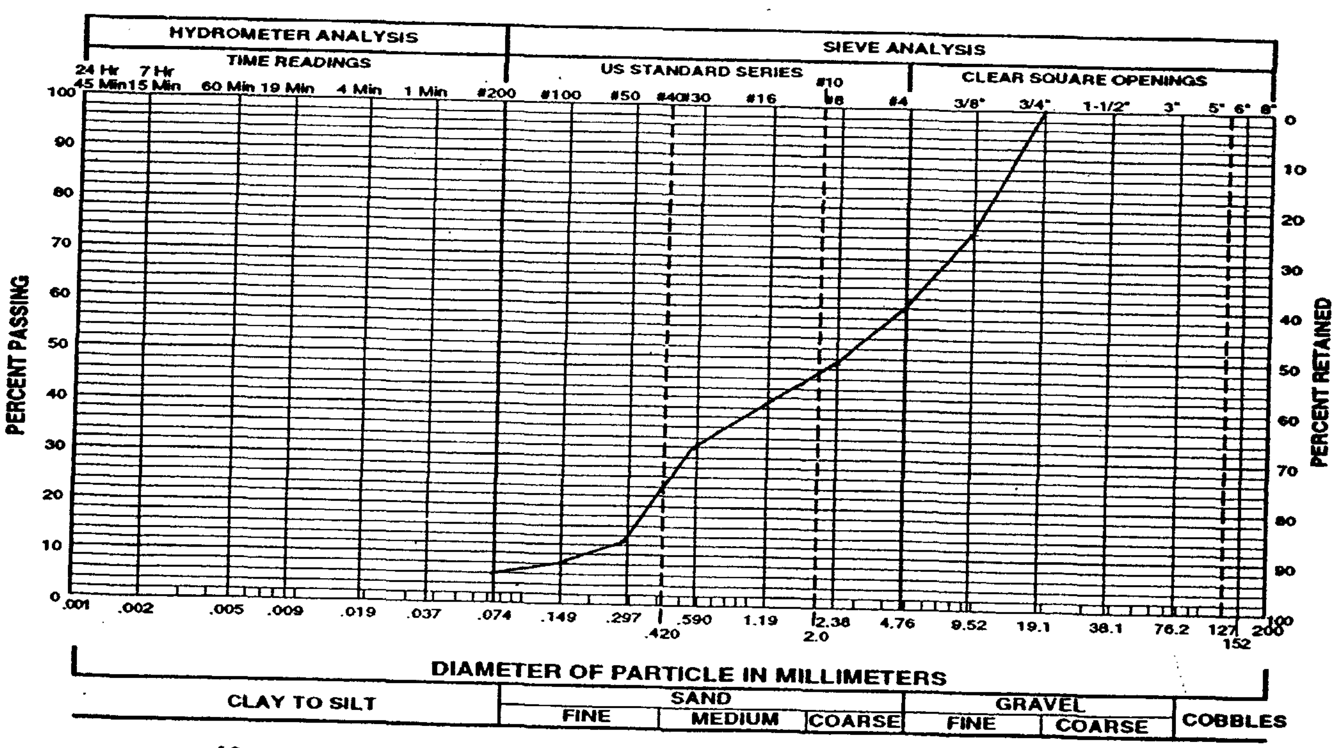


1020875 **CONSOLIDATION TEST RESULTS** **Figure 19**

Applied Geotechnical Engineering Consultants, Inc.



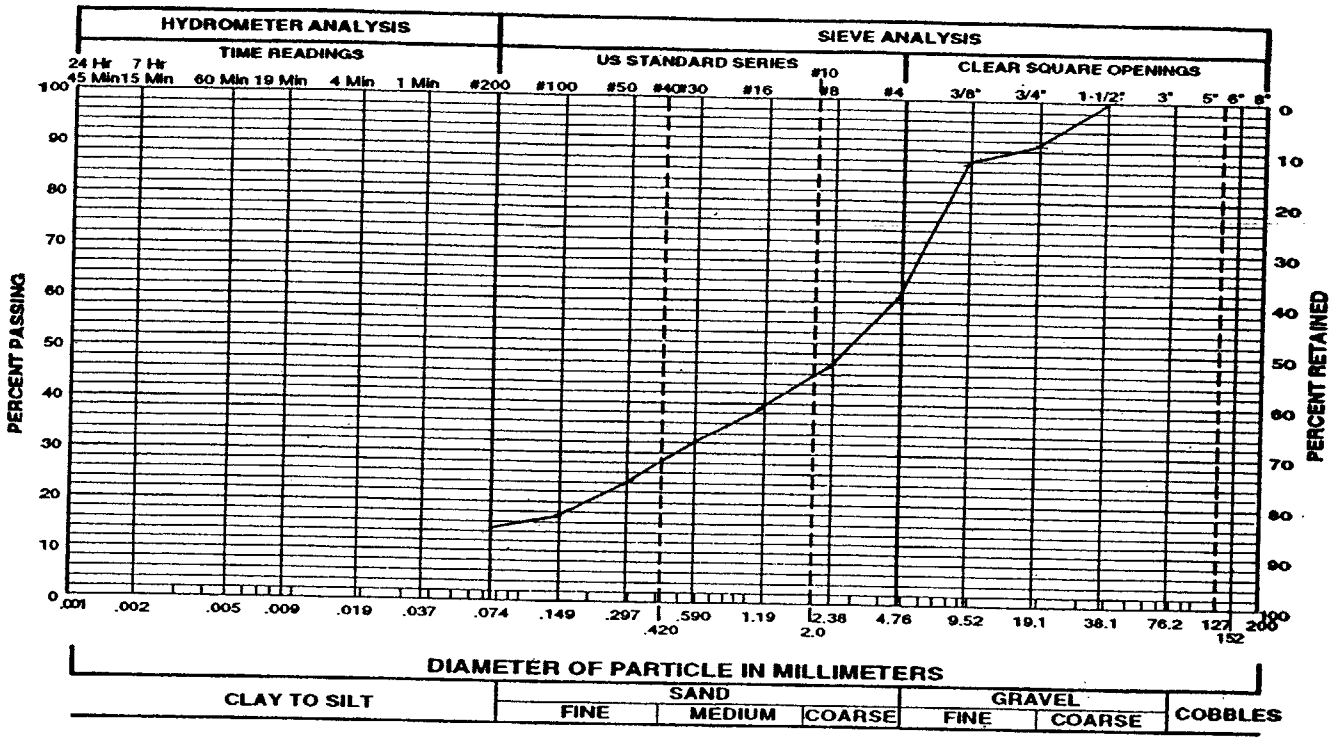
Gravel 43 % Sand 42 % Silt and Clay 15 %
Liquid Limit ____ % Plasticity Index ____ %
Sample of Clayey Gravel with Sand From MW-1 @ 38'



Gravel 40 % Sand 54 % Silt and Clay 6 %
Liquid Limit ____ % Plasticity Index ____ %
Sample of Poorly-graded Sand with Silt and Gravel From MW-3 @ 43'

Project No. 1020875 **GRADATION TEST RESULTS** Figure 20

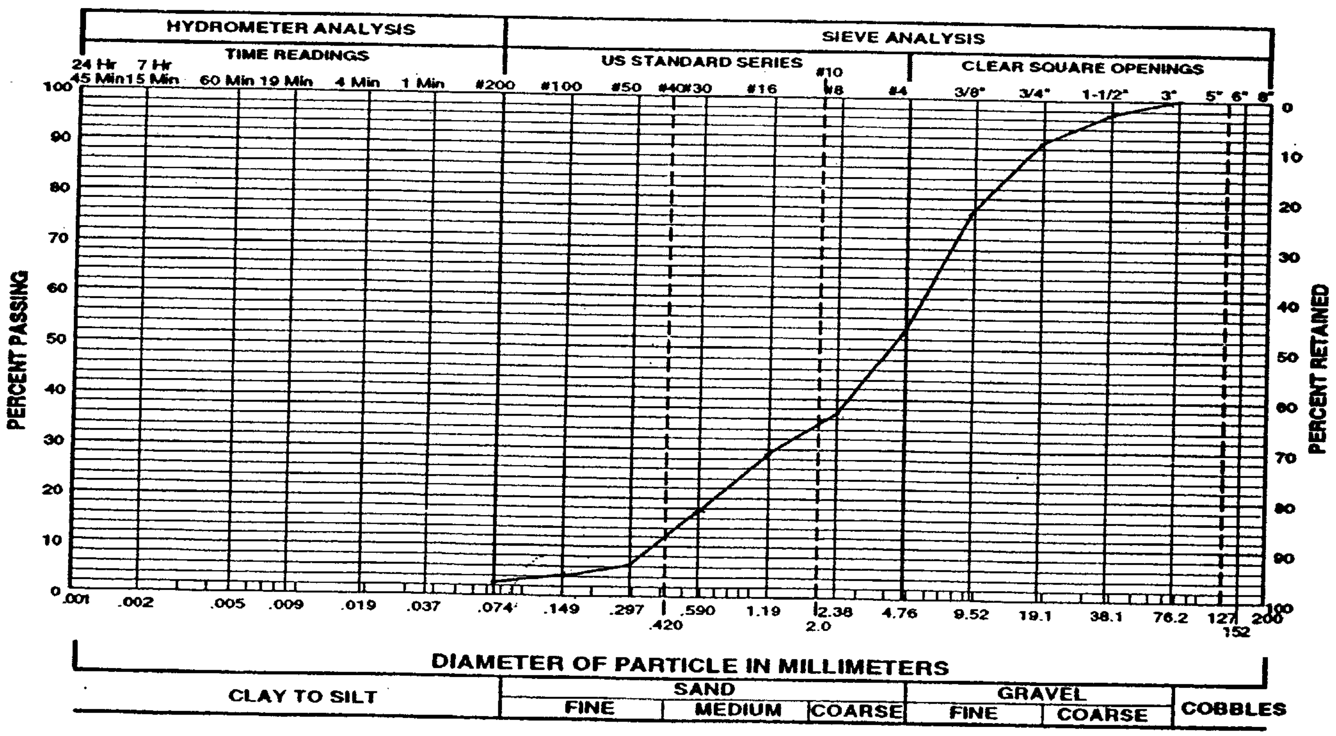
Applied Geotechnical Engineering Consultants, Inc.



Gravel 39 % Sand 47 % Silt and Clay 14 %

Liquid Limit ___ % Plasticity Index ___ %

Sample of Silty Sand with Gravel From TP-3 @ 2'



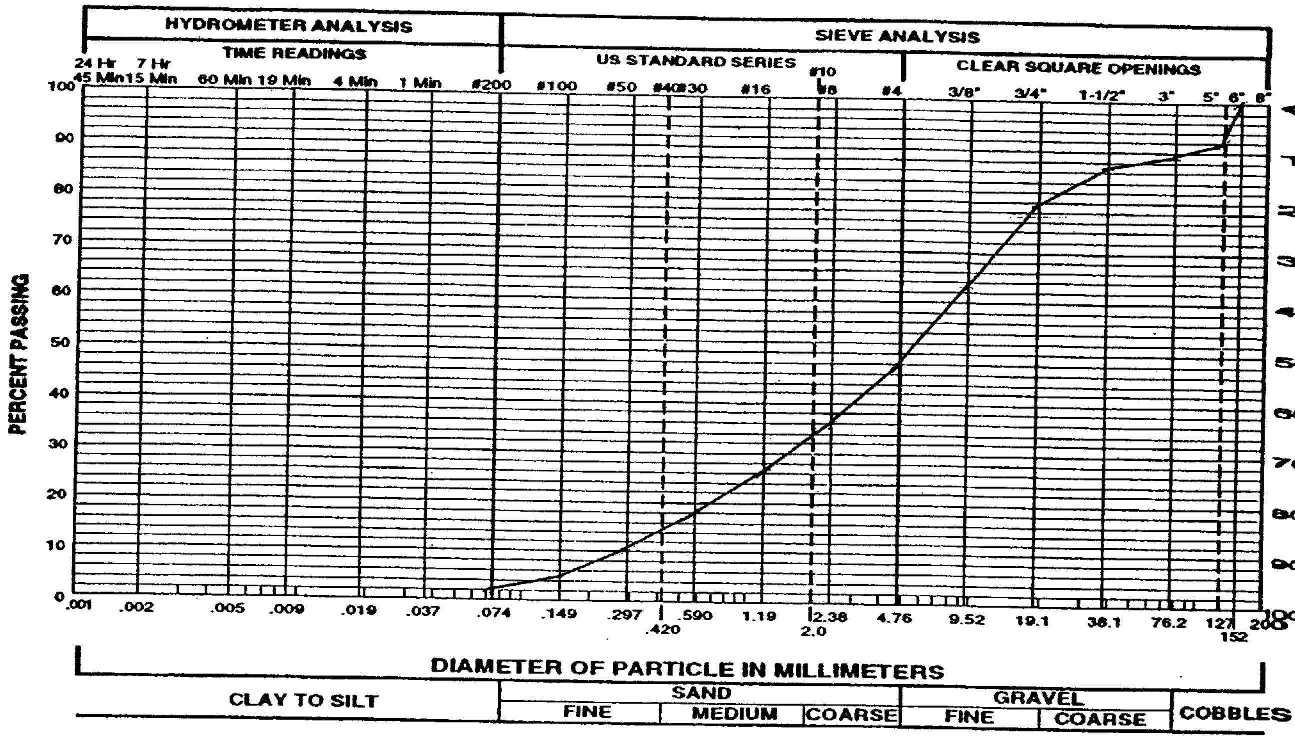
Gravel 47 % Sand 50 % Silt and Clay 3 %

Liquid Limit ___ % Plasticity Index ___ %

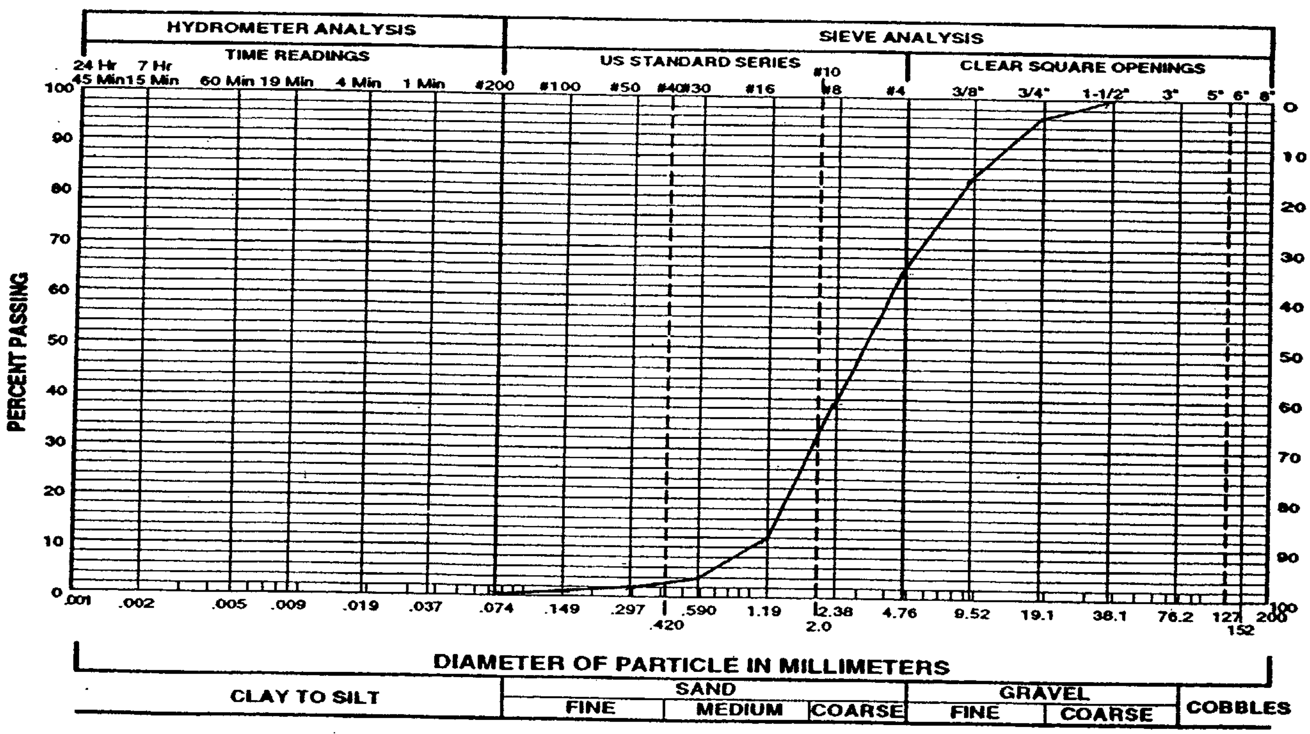
Sample of Poorly-graded Sand with Gravel From TP-10 @ 4'

Project No. 1020875 **GRADATION TEST RESULTS** Figure 21

Applied Geotechnical Engineering Consultants, Inc.



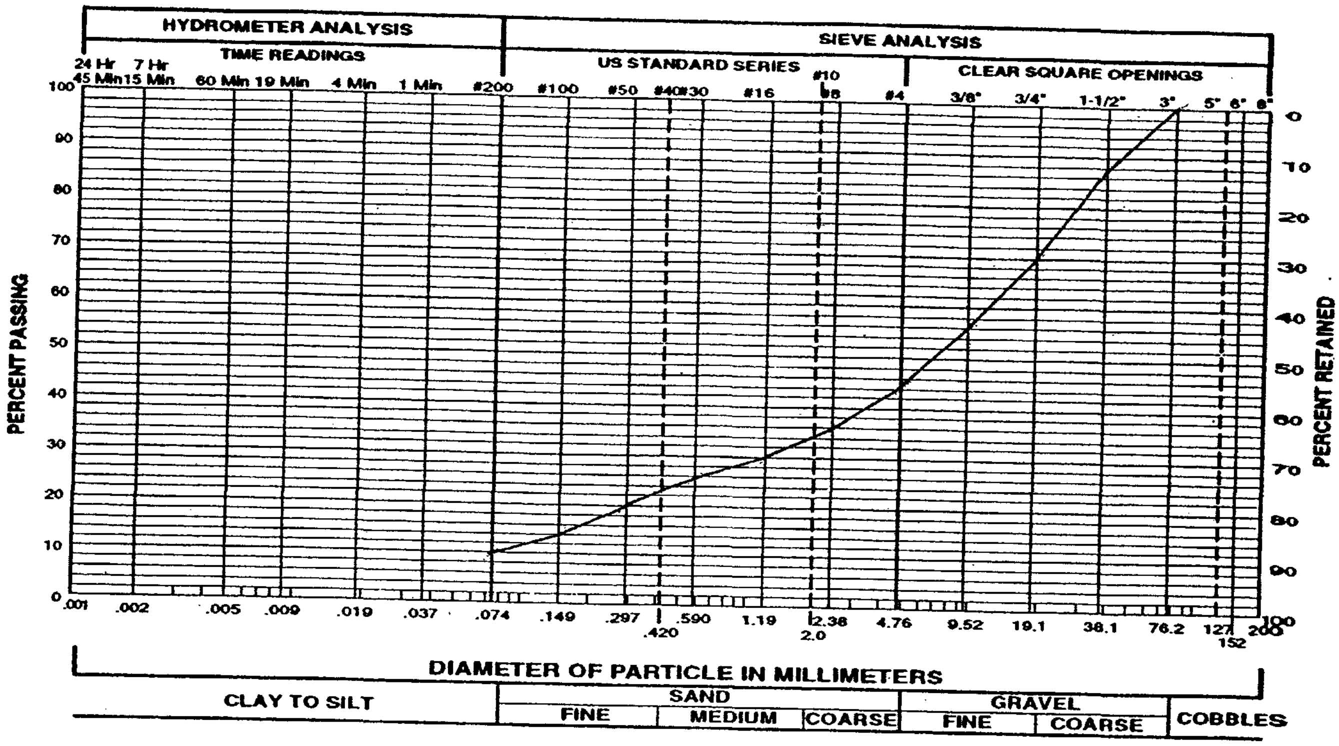
Gravel 53 % Sand 45 % Silt and Clay 2 %
Liquid Limit ____ % Plasticity Index ____ %
Sample of Poorly-graded Gravel with Sand From TP-19 @ 5'



Gravel 35 % Sand 64 % Silt and Clay 1 %
Liquid Limit ____ % Plasticity Index ____ %
Sample of Poorly-graded Sand with Gravel From TP-23 @ 4'

Project No. 1020875 **GRADATION TEST RESULTS** Figure 22

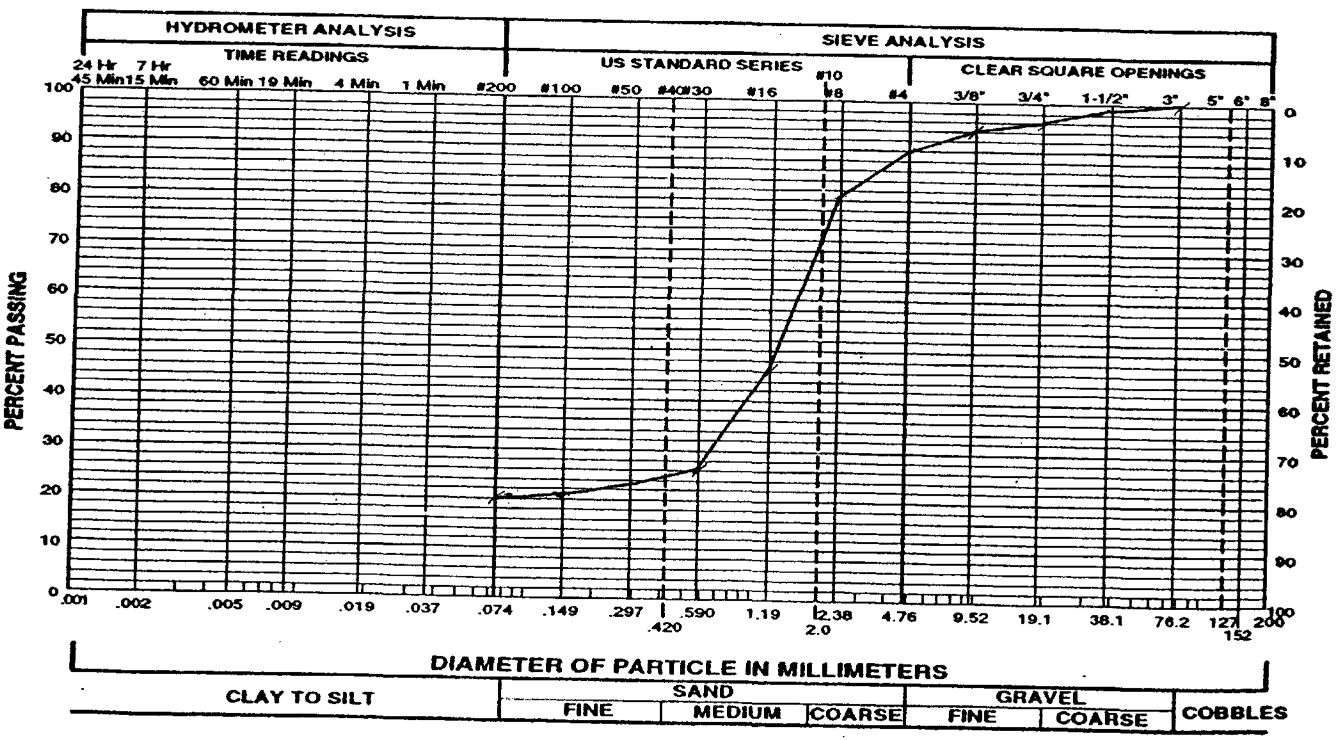
Applied Geotechnical Engineering Consultants, Inc.



Gravel 56 %   Sand 34 %   Silt and Clay 10 %

Liquid Limit ____ %   Plasticity Index ____ %

Sample of Well-graded Gravel with Silt and Sand   From TP-24 @ 4'



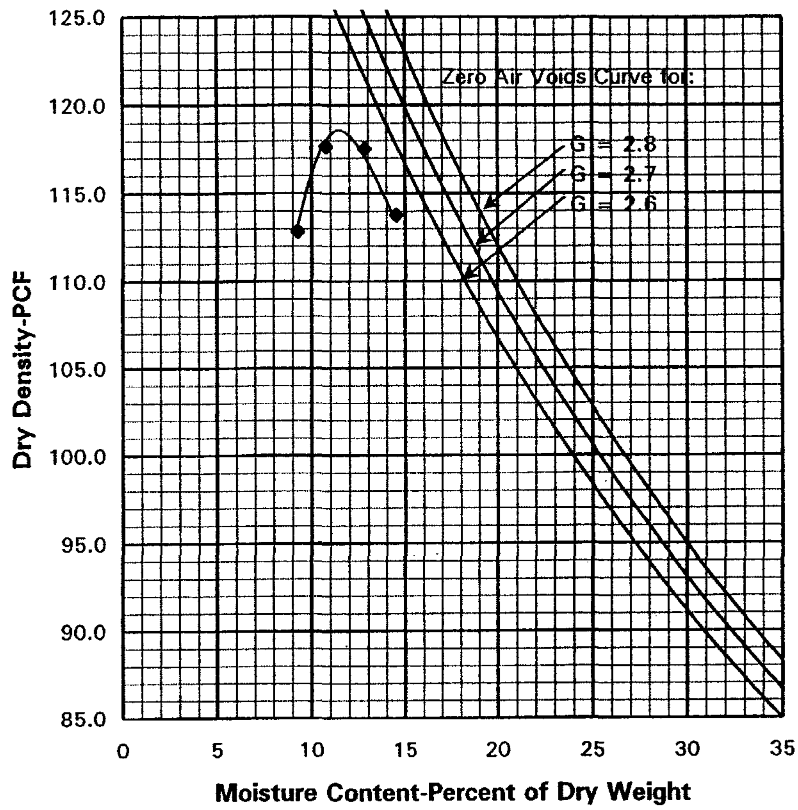
Gravel 10 %   Sand 70 %   Silt and Clay 20 %

Liquid Limit ____ %   Plasticity Index ____ %

Sample of Clayey Sand   From TP-27 @ 2'

Project No. 1020875   **GRADATION TEST RESULTS**   Figure 23

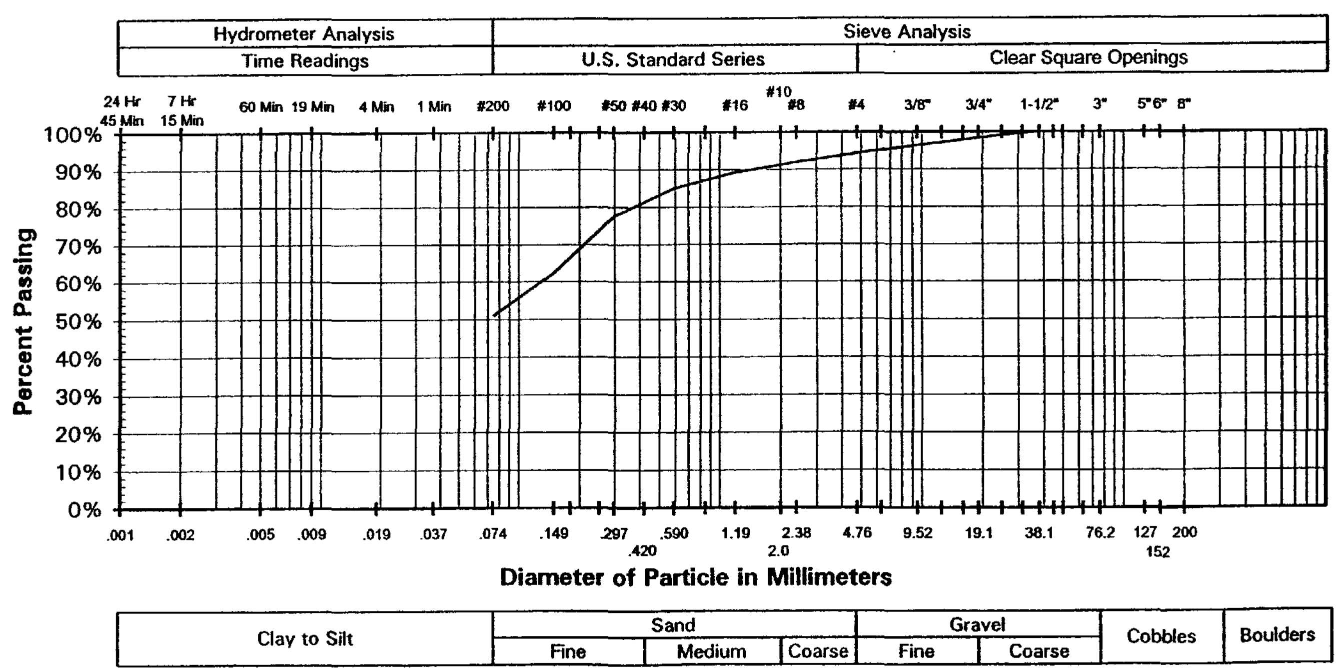
APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Project	Promontory Point
Sample Location	TP-20 @ 2'
Maximum Dry Density	118.5 pcf
Optimum Moisture	11.5%
Atterberg Limits	
Liquid Limit	19%
Plasticity Index	5%
Gradation	
Gravel	6%
Sand	43%
Silt & Clay	51%

Test Procedure: ASTM D-698 A

Sample Description: Sandy Silty Clay (CL-ML)

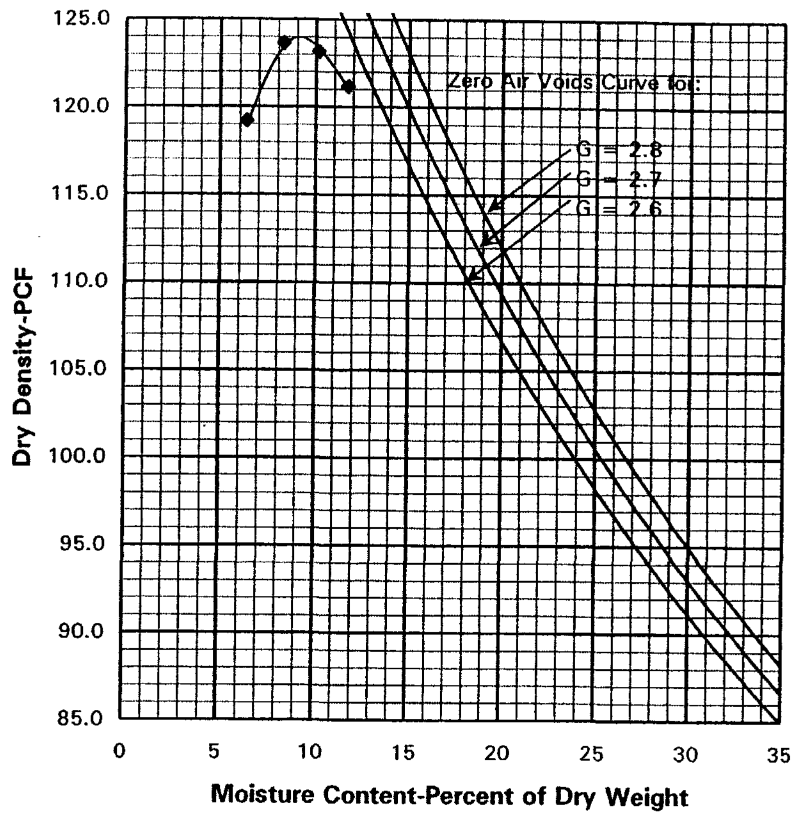


Project No. 1020875

GRADATION & MOISTURE-DENSITY RELATIONSHIP

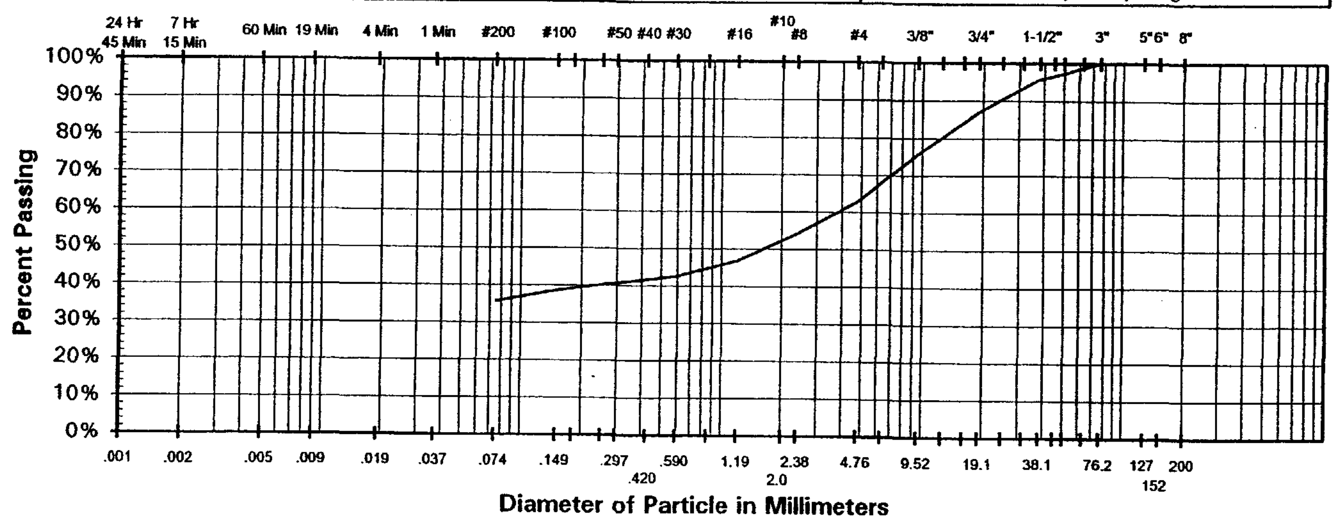
Figure 24

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Project	Promontory Point
Sample Location	TP-21 @ 2'
Maximum Dry Density	124 pcf
Optimum Moisture	9%
Atterberg Limits	
Liquid Limit	34%
Plasticity Index	15%
Gradation	
Gravel	37%
Sand	27%
Silt & Clay	36%

Test Procedure: ASTM D-698 C
Sample Description: Clayey Gravel with Sand (GC)

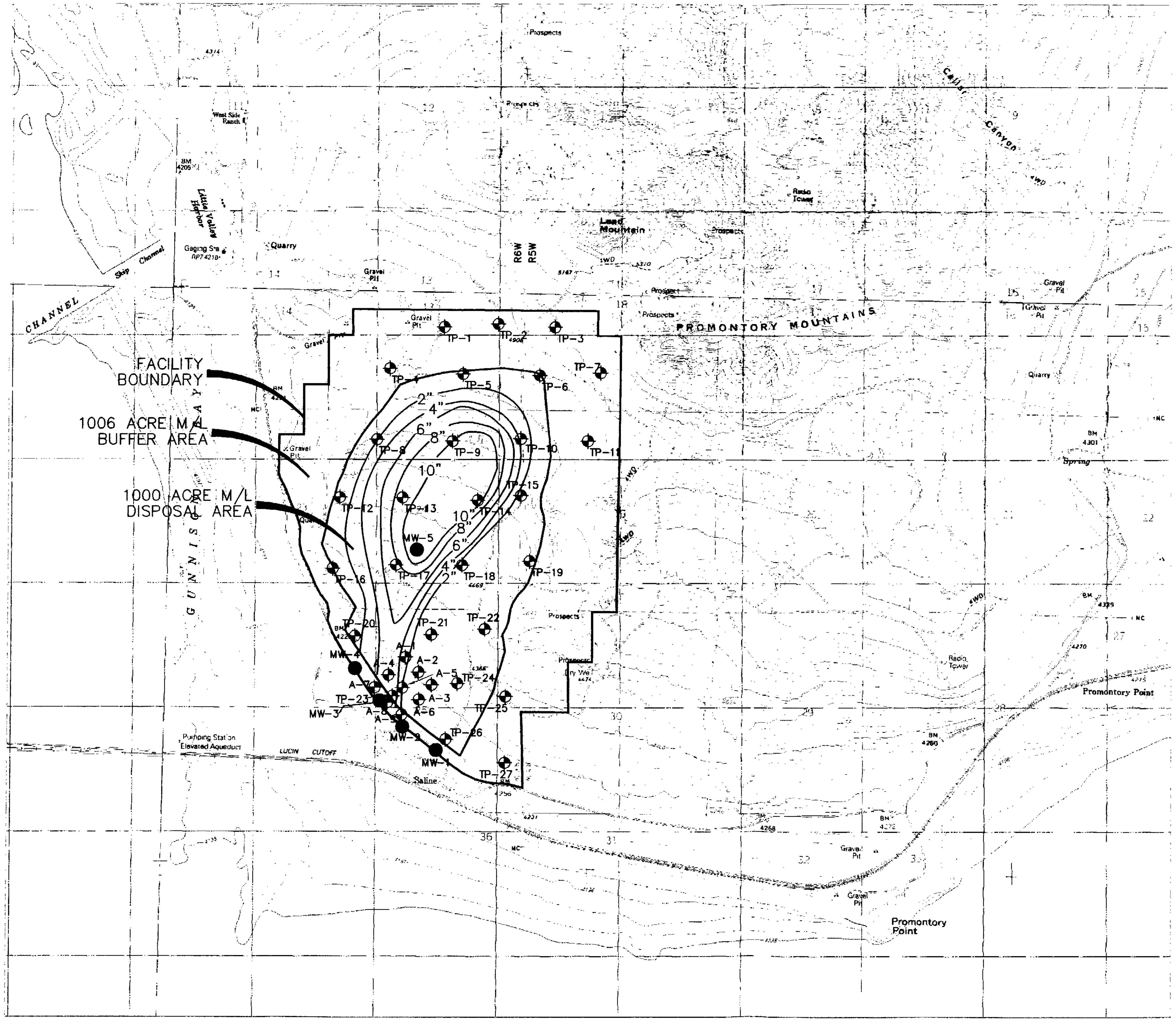


Clay to Silt	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

GRADATION & MOISTURE-DENSITY RELATIONSHIP

Project No. 1020875

Figure 25



N

0 3000 6000 feet

Approximate Scale

PROMONTORY POINT LANDFILL
BOX ELDER COUNTY, UTAH

Note: The settlement estimate given is for the proposed 4:1 (H:V) slopes shown on the plan (Aqua Figure 4.5) dated December 2002. We have assumed 10' of soil to be removed. Bedrock strain is not included in the numbers shown and is estimated to be 0 to 6 inches.

Legend:

- Test Pit Location
- Monitor Well Location

1020875	AGEC	Foundation Settlement Estimate	Figure 26

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I
SUMMARY OF LABORATORY TEST RESULTS

PROJECT NUMBER 1020875

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION			ATTERBERG LIMITS		STANDARD PROCTOR		SAMPLE CLASSIFICATION
BORING/ TEST PIT	DEPTH (FEET)			GRAVEL (%)	SAND (%)	SILT/ CLAY (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	
MW-1	8	3	124	26	63	11					Poorly Graded Sand with Silt and Gravel
	23	13	120	23	41	36					Clayey Sand with Gravel
	38	8		43	42	15					Clayey Gravel with Sand
MW-2	13	6	114	38	41	21					Clayey Sand with Gravel
	33	6	117	52	24	24					Clayey Gravel with Sand
	38	7		65	20	15					Clayey Gravel with Sand
	58			53	33	14					Clayey Gravel with Sand
MW-3	23	4	119	38	47	15					Clayey Sand with Gravel
	28			62	22	16					Clayey Gravel with Sand
	43	7		40	54	6					Poorly Graded Sand with Silt and Gravel
MW-4	18	3	120	50	43	7					Poorly Graded Gravel with Silt and Sand
	48	8	132	25	60	15					Clayey Sand with Gravel
	53	13	124	31	47	22					Clayey Sand with Gravel
	88	11	130	39	40	21					Clayey Sand with Gravel
MW-5	28	18	113			72					Lean Clay with Sand

APPLIED GEOTECHNICAL ENG ...ERING CONSULTANTS, INC.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NUMBER 1020875

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION			ATTERBERG LIMITS		STANDARD PROCTOR		SAMPLE CLASSIFICATION
BORING/ TEST PIT	DEPTH (FEET)			GRAVEL (%)	SAND (%)	SILT/ CLAY (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	
TP-1	2	9	74			96	26	6			Silty Clay
TP-2	4	8	87			63					Sandy Lean Clay
TP-3	2			39	47	14					Silty Sand with Gravel
TP-10	4			47	50	3					Poorly Graded Sand with Gravel
TP-11	9	15	102			73					Lean Clay with Sand
TP-13	2	14	98			90					Lean Clay
TP-18	4	6	97			35					Silty Sand
TP-19	5			53	45	2					Poorly Graded Gravel with Sand
TP-20	2	5	90			47					Clayey Sand
	2			6	43	51	19	5	118.5	11.5	Sandy Silty Clay
TP-21	2			37	27	36	34	15	124	9	Clayey Gravel with Sand

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NUMBER 1020875

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION			ATTERBERG LIMITS		STANDARD PROCTOR		SAMPLE CLASSIFICATION
BORING/ TEST PIT	DEPTH (FEET)			GRAVEL (%)	SAND (%)	SILT/ CLAY (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	
TP-23	4			35	64	1					Poorly Graded Sand with Gravel
	7	17	107			72					Lean Clay with Sand
TP-24	2			44	30	26					Clayey Gravel with Sand
	4			56	34	10					Well Graded Gravel with Silt and Sand
TP-27	2			10	70	20					Clayey Sand

APPENDIX

Stability and Settlement Calculations

AGEC

Applied Geotechnical Engineering Consultants, Inc.

PROJECT NO. 1020875 TITLE Promontory Point DATE 6/14/03 BY JRW

SUBJECT Long Term Stability SHEET ____ OF ____

Parameters

- Slope 4:1 (H:V)
- Waste Strength $\phi = 25^\circ$ (Singh and Murphy, 1990)
- All other contacts between materials in cap will need to have friction angles $\geq 25^\circ$

Static - infinite slope analysis

$$\frac{\tan 25^\circ}{1/4} = 1.9 \quad \text{ok}$$

Seismic - pseudostatic/infinite slope analysis

- 10% in 250 year PGA = 0.55g (Frankel, et al 1996)
- M = 7
- r ≤ 10 km
- From Figure 11-1 (SCEC/ASCE, 2002)

$f_{eq} = 0.39$ (15 cm deformation)

$f_{eq} = 0.51$ (5 cm deformation)

$$FS = \left[\frac{\cos\alpha}{\sin\alpha + K\cos\alpha}\right]\tan\phi$$

where: k = seismic coeff.
α = slope angle

15 cm deformation

$K = (0.39)(0.55g) = 0.215g$

FS = 1.0

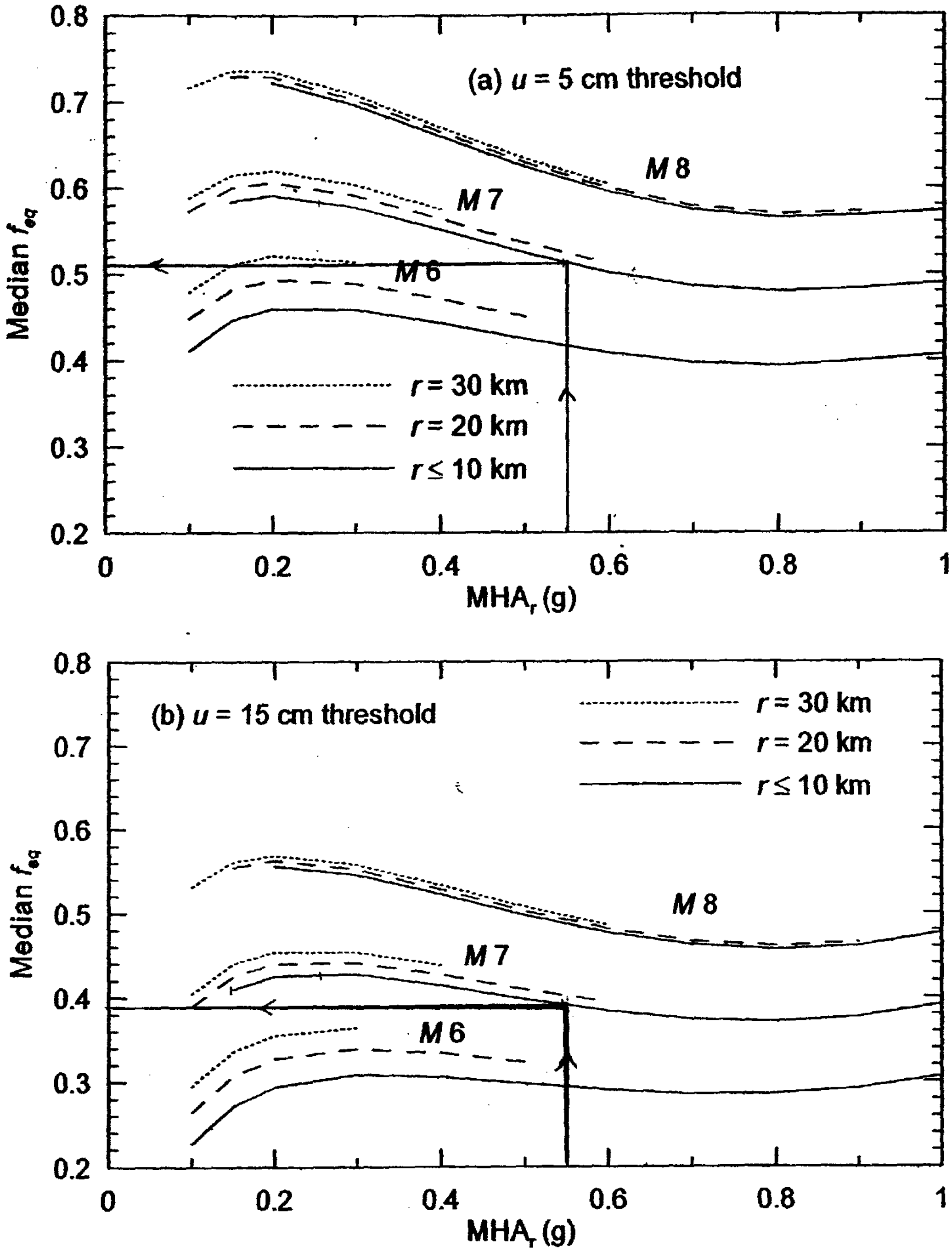


Figure 11.1. Required Values of f_{eq} as Function of MHA$_r$ and Seismological Condition for Threshold Displacements of (a) 5 cm and (b) 15 cm

Project 1020875
Promontory Point Landfill - Settlement Analysis

Soil Unit Weight 120
Waste Unit Weight 110

Test Pit Boring	Existing Elevation (ft)	Final Elevation (ft)	Fill height (ft)	Depth Top Layer (ft)	Depth Bottom Layer (ft)	Layer Thickne (ft)	Soil Type	C'c	C'r	Maximum Past Pressure (psf)	Po' (psf)	Applied Pressure P (psf)	Po'+P	recomp. sett. (in)	virgin sett. (in)	total sett. (in)	cumulative sett. (in)
MW5	4440	4850	410	0	3	3	CL	0.068	0.008	4000	180	45100	45280	0.39	2.58	2.97	0.00
				3	10	7	SM	0.004	0.004	4000	780		45880	0.24	0.36	0.59	0.00
				10	15	5	SM	0.004	0.004	4000	1500		46600	0.10	0.26	0.36	0.36
				15	20	5	GP	0.004	0.004	4000	2100		47200	0.07	0.26	0.32	0.68
				20	25.5	5.5	CL	0.068	0.008	4000	2730		47830	0.09	4.84	4.92	5.61
				25.5	29	3.5	SP	0.004	0.004	4000	3270		48370	0.01	0.18	0.20	5.80
				29	31	2	CL	0.068	0.008	4000	3600		48700	0.01	1.77	1.78	7.58
				31	36	5	GC	0.004	0.004	4000	4020		49120	0.00	0.26	0.26	7.84
				36	41	5	GC	0.004	0.004	4000	4620		49720	0.00	0.25	0.25	7.83
MW5		max	800	0	3	3	CL	0.068	0.008	4000	180	88000	88180	0.39	3.29	3.68	0.00
				3	10	7	SM	0.004	0.004	4000	780		88780	0.24	0.45	0.69	0.00
				10	15	5	SM	0.004	0.004	4000	1500		89500	0.10	0.32	0.43	0.43
				15	20	5	GP	0.004	0.004	4000	2100		90100	0.07	0.32	0.39	0.82
				20	25.5	5.5	CL	0.068	0.008	4000	2730		90730	0.09	6.08	6.17	6.99
				25.5	29	3.5	SP	0.004	0.004	4000	3270		91270	0.01	0.23	0.24	7.23
				29	31	2	CL	0.068	0.008	4000	3600		91600	0.01	2.22	2.23	9.46
				31	41	10	GC	0.004	0.004	4000	4320		92320	0.00	0.64	0.64	10.10
TP-8	4680	4800	120	0	3	3	CL	0.068	0.008	4000	180	13200	13380	0.39	1.28	1.67	0.00
				3	6	3	GP	0.004	0.004	4000	540		13740	0.13	0.08	0.20	0.00
TP-10	4755	5000	245	0	8	8	SP	0.004	0.004	4000	480	26950	27430	0.35	0.32	0.67	0.00
				8	10	2	CL	0.068	0.008	4000	1080		28030	0.11	1.38	1.49	0.00
				10	11	1	CL	0.068	0.008	4000	1260		28210	0.05	0.69	0.74	0.74
				11	16	5	GP	0.004	0.004	4000	1620		28570	0.09	0.20	0.30	1.04
				16	21	5	GP	0.004	0.004	4000	2220		29170	0.06	0.21	0.27	1.31
				21	26	5	GP	0.004	0.004	4000	2820		29770	0.04	0.21	0.25	1.55
				26	30	4	GP	0.004	0.004	4000	3360		30310	0.01	0.17	0.18	1.74

TP-12	4520	4600	80	0	3	3 GP	0.004	0.004	4000	180	8800	8980	0.19	0.05	0.24	0.00
TP-13	4530	5000	470	0	5	5 CL	0.068	0.008	4000	300	51700	52000	0.54	4.54	5.08	0.00
				5	10	5 SM	0.004	0.004	4000	900		52600	0.16	0.27	0.42	0.00
				10	11	1 SM	0.004	0.004	4000	1260		52960	0.02	0.05	0.08	0.08
				11	20	9 GP	0.004	0.004	4000	1860		53560	0.14	0.49	0.63	0.71
				20	25.5	5.5 CL	0.068	0.008	4000	2730		54430	0.09	5.09	5.18	5.88
				25.5	29	3.5 SP	0.004	0.004	4000	3270		54970	0.01	0.19	0.21	6.09
				29	31	2 CL	0.068	0.008	4000	3600		55300	0.01	1.86	1.87	7.96
				31	36	5 GC	0.004	0.004	4000	4020		55720	0.00	0.27	0.27	8.24
				36	41	5 GC	0.004	0.004	4000	4620		56320	0.00	0.28	0.28	8.51
TP-14	4585	5250	665	0	5	5 SC/GP	0.004	0.004	4000	300	73150	73450	0.27	0.30	0.57	0.00
				5	10	5 SM	0.004	0.004	4000	900		74050	0.16	0.30	0.46	0.00
				10	11	1 SM	0.004	0.004	4000	1260		74410	0.02	0.06	0.09	0.09
				11	20	9 GP	0.004	0.004	4000	1860		75010	0.14	0.55	0.69	0.78
				20	25.5	5.5 CL	0.068	0.008	4000	2730		75880	0.09	5.74	5.82	6.60
				25.5	29	3.5 SP	0.004	0.004	4000	3270		76420	0.01	0.22	0.23	6.83
				29	31	2 CL	0.068	0.008	4000	3600		76750	0.01	2.09	2.10	8.93
				31	36	5 GC	0.004	0.004	4000	4020		77170	0.00	0.31	0.31	9.24
				36	41	5 GC	0.004	0.004	4000	4620		77770	0.00	0.31	0.31	9.55
TP-17	4425	4700	275	0	5	5 SC/GP	0.004	0.004	4000	300	30250	30550	0.27	0.21	0.48	0.00
				5	10	5 SM	0.004	0.004	4000	900		31150	0.16	0.21	0.37	0.00
				10	11	1 SM	0.004	0.004	4000	1260		31510	0.02	0.04	0.07	0.07
				11	20	9 GP	0.004	0.004	4000	1860		32110	0.14	0.39	0.53	0.60
				20	25.5	5.5 CL	0.068	0.008	4000	2730		32980	0.09	4.11	4.20	4.80
				25.5	29	3.5 SP	0.004	0.004	4000	3270		33520	0.01	0.16	0.17	4.97
				29	31	2 CL	0.068	0.008	4000	3600		33850	0.01	1.51	1.52	6.49
				31	41	10 GC	0.004	0.004	4000	4320		34570	0.00	0.45	0.45	6.94
TP-18	4462	5050	588	0	10	10 SP	0.004	0.004	4000	600	64680	65280	0.40	0.58	0.98	0.00
				10	14	4 SP	0.004	0.004	4000	1440		66120	0.09	0.23	0.32	0.32
TP-19	4600	4700	100	0	10	10 GP	0.004	0.004	4000	600	11000	11600	0.40	0.22	0.62	0.00
				10	14	4 GP	0.004	0.004	4000	1440		12440	0.09	0.09	0.18	0.18

TP-22	4450	4700	250	0	3	3	CL	0.068	0.008	4000	180	27500	27680	0.39	2.06	2.44	0.00
TP-21	4350	4700	350	0	5	5	GP	0.004	0.004	4000	300	38500	38800	0.27	0.24	0.51	0.00
TP-24	4325	4550	225	0	10	10	GP	0.004	0.004	4000	600	24750	25350	0.40	0.38	0.78	0.00
				10	11	1	GP	0.004	0.004	4000	1260		26010	0.02	0.04	0.06	0.06
TP-26	4260	4300	40	0	10	10	SC/GP	0.004	0.004	4000	600	4400	5000	0.40	0.05	0.44	0.00
				10	15	5	SC/GP	0.004	0.004	4000	1500		5900	0.10	0.04	0.14	0.14
				15	20	5	SC/GP	0.004	0.004	4000	2100		6500	0.07	0.05	0.12	0.26
				20	25	5	SC/GP	0.004	0.004	4000	2700		7100	0.04	0.06	0.10	0.36
				25	30	5	SC/GP	0.004	0.004	4000	3300		7700	0.00	0.07	0.07	0.43
				30	43	13	SC/GP	0.004	0.004	4000	3818.4		8218.4	0.00	0.20	0.20	0.62
A-4	4278	4350	72	0	7	7	SC/GP	0.004	0.004	4000	420	7920	8340	0.33	0.11	0.44	0.00
				7	10	3	CL	0.068	0.008	4000	1020		8940	0.17	0.86	1.03	0.00
				10	14	4	GP	0.004	0.004	4000	1440		9360	0.09	0.07	0.16	0.16
				14	20	6	CL	0.068	0.008	4000	2040		9960	0.17	1.94	2.11	2.26
				20	25	5	SP	0.004	0.004	4000	2700		10620	0.04	0.10	0.14	2.41
				25	30	5	SP	0.004	0.004	4000	3300		11220	0.02	0.11	0.13	2.53
				30	35	5	SP	0.004	0.004	4000	3900		11820	0.00	0.12	0.12	2.65
				35	40	5	SP	0.004	0.004	4000	4188		12108	0.00	0.11	0.11	2.76
				40	50	10	SP	0.004	0.004	4000	4764		12684	0.00	0.20	0.20	2.96
				50	60	10	SP	0.004	0.004	4000	5340		13260	0.00	0.19	0.19	3.15
				60	70	10	SP	0.004	0.004	4000	5916		13836	0.00	0.18	0.18	3.33
				70	80	10	SP	0.004	0.004	4000	6492		14412	0.00	0.17	0.17	3.50
				80	90	10	SP	0.004	0.004	4000	7068		14988	0.00	0.16	0.16	3.65
				90	100	10	SP	0.004	0.004	4000	7644		15564	0.00	0.15	0.15	3.80
A-8	4260	4300	40	0	3	3	SC/GP	0.004	0.004	4000	180	4400	4580	0.19	0.01	0.20	0.00
				3	10	7	CL	0.068	0.008	4000	780		5180	0.48	0.64	1.12	0.00
				10	17	7	CL	0.068	0.008	4000	1620		6020	0.26	1.01	1.28	1.28
				17	25	8	SP	0.004	0.004	4000	2520		6920	0.08	0.09	0.17	1.45
				25	30	5	SP	0.004	0.004	4000	3300		7700	0.02	0.07	0.09	1.53
				30	35	5	SP	0.004	0.004	4000	3900		8300	0.00	0.08	0.08	1.61
				35	40	5	SP	0.004	0.004	4000	4188		8588	0.00	0.07	0.07	1.69

40	50	10 SP	0.004	0.004	4000	4764	9164	0.00	0.14	0.14	1.82
50	60	10 SP	0.004	0.004	4000	5340	9740	0.00	0.13	0.13	1.95
60	70	10 SP	0.004	0.004	4000	5916	10316	0.00	0.12	0.12	2.07
70	80	10 SP	0.004	0.004	4000	6492	10892	0.00	0.11	0.11	2.17
80	90	10 SP	0.004	0.004	4000	7068	11468	0.00	0.10	0.10	2.27
90	100	10 SP	0.004	0.004	4000	7644	12044	0.00	0.09	0.09	2.37

APPENDIX E
WATER RIGHT INFORMATION

AQUA ENGINEERING, INC.

UTAH DIVISION OF WATER RIGHTS

WRPRINT Water Right Information Listing

Version: 2002.07.10.00 **Rundate: 12/06/2002 10:12 AM**

Water Right 13-2072

Select Related Information

```
[WRPRINT] ***WR#: 13 2072 has been PRINTED!!
                              (WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/06/2002  Page 1
WRNUM: 13-2072      APPLICATION/CLAIM NO.:                CERT. NO.:
-----------------------------------------------------------------------------------------------------------------------------------
OWNERSHIP**************************************************************************************************************************
-----------------------------------------------------------------------------------------------------------------------------------
NAME: Young Resources Limited Partnership                            OWNER MISC:
ADDR: 4990 North Highway 38
CITY: Brigham City                   STATE: UT  ZIP: 84302         INTEREST: 100%
LAND OWNED BY APPLICANT?
-----------------------------------------------------------------------------------------------------------------------------------
DATES, ETC.************************************************************************************************************************
-----------------------------------------------------------------------------------------------------------------------------------
FILING:       / /     |PRIORITY:  00/00/1930|ADV BEGAN:   / /     |ADV ENDED:    / /     |NEWSPAPER:
PROTST END:  / /      |PROTESTED: [   ]     |APPR/REJ:  [         ]|APPR/REJ:    / /     |PROOF DUE:   / /    |EXTENSION:     / /
ELEC/PROOF:[        ]|ELEC/PROOF:  / /      |CERT/WUC:  03/30/1968|LAP, ETC:     / /     |PROV LETR:   / /    |RENOVATE:      / /
PD Book No.  3  Type of Right: DIL   Status:       Source of Info: PDET  Map: 232     Date Verified: 08/02/1996  Initials: JPJ
-----------------------------------------------------------------------------------------------------------------------------------
LOCATION OF WATER RIGHT************************************************************************************************************
-----------------------------------------------------------------------------------------------------------------------------------
FLOW: 0.015 cfs                                        SOURCE: Underground Water Well
COUNTY: Box Elder    COMMON DESCRIPTION: Promontory Point
POINT OF DIVERSION -- UNDERGROUND:
(1) N 1900 ft W  350 ft from S4 cor, Sec 25, T  6N, R  6W, SLBM DIAM:    ins. DEPTH:      to      ft. YEAR DRILLED:      WELL LOG?
         Comment:
-----------------------------------------------------------------------------------------------------------------------------------
USES OF WATER RIGHT****************************************************************************************************************
-----------------------------------------------------------------------------------------------------------------------------------
CLAIMS USED FOR PURPOSE DESCRIBED: 1947, 2072
     Referenced To:           Claims Groups:                          Type of Reference -- Claims:    Purpose:    Remarks:
...................................................................................................................................
  ###STOCKWATERING: 810 Cattle or Equivalent                           Diversion Limit:          acft. PERIOD OF USE: 01/01 TO 12/31
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII E N D   O F   D A T A IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
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UTAH DIVISION OF WATER RIGHTS

WRPRINT Water Right Information Listing

Version: 2002.07.10.00 Rundate: 12/06/2002 10:10 AM

Water Right 13-2774

Select Related Information

```
[WRPRINT] ***WR#: 13 2774 has been PRINTED!!
                    (WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/06/2002  Page 1
WRNUM: 13-2774      APPLICATION/CLAIM NO.: A41097      CERT. NO.:
--------------------------------------------------------------------------------------------------------------------------------
OWNERSHIP***********************************************************************************************************************
--------------------------------------------------------------------------------------------------------------------------------
NAME: Lake Crystal Salt Co.                                        OWNER MISC:
ADDR: 720 Exchange Lane P.O. Box 1149
CITY: Ogden                          STATE: UT  ZIP: 84402         INTEREST:
LAND OWNED BY APPLICANT? No
--------------------------------------------------------------------------------------------------------------------------------
DATES, ETC.*********************************************************************************************************************
--------------------------------------------------------------------------------------------------------------------------------
FILING:     01/28/1972|PRIORITY:  01/28/1972|ADV BEGAN:   /  /    |ADV ENDED:   /  /    |NEWSPAPER:
PROTST END:  /  /    |PROTESTED: [    ]     |APPR/REJ:  [        ]|APPR/REJ:  06/19/1972|PROOF DUE:   /  /    |EXTENSION:    /  /
ELEC/PROOF:[Election]|ELEC/PROOF:07/11/1974|CERT/WUC:  01/31/1975|LAP, ETC:     /  /    |PROV LETR:   /  /    |RENOVATE:     /  /
PD Book No.     Type of Right: APPL  Status: WUCS  Source of Info: WUC   Map: 232      Date Verified: 02/19/1986  Initials: FW
--------------------------------------------------------------------------------------------------------------------------------
LOCATION OF WATER RIGHT*********************************************************************************************************
--------------------------------------------------------------------------------------------------------------------------------
FLOW: 0.011 cfs                                         SOURCE: Underground Water Well
COUNTY: Box Elder    COMMON DESCRIPTION: Promontory Mountains
POINT OF DIVERSION -- UNDERGROUND:
(1) N 2700 ft W  100 ft from SE cor, Sec 25, T  6N, R  6W, SLBM DIAM:  6 ins. DEPTH:   70 to  100 ft. YEAR DRILLED:      WELL LOG?
         Comment:
--------------------------------------------------------------------------------------------------------------------------------
USES OF WATER RIGHT*************************************************************************************************************
--------------------------------------------------------------------------------------------------------------------------------
CLAIMS USED FOR PURPOSE DESCRIBED: 2774
     Referenced To:            Claims Groups:                        Type of Reference -- Claims:     Purpose:     Remarks:
................................................................................................................................
  ###IRRIGATION         *---NORTH WEST QUARTER--*---NORTH EAST QUARTER--*---SOUTH WEST QUARTER--*---SOUTH EAST QUARTER--*   Section
Tot Irr. Acrg.:     1.00* NW    NE    SW    SE * NW    NE    SW    SE * NW    NE    SW    SE * NW    NE    SW    SE *   Totals
 Sec 24 T  6N R  6W SLBM *     :     :     :     *     :     :     :     *     :     :     :     *     :     : 1.00:     *      1.00
```

```
    or a Total of 1.00 acres.
                                        Sole Supply:           acres  Diversion Limit:           acft. PERIOD OF USE: 04/01 TO 10/31
.....................................................................................................................................
  ###DOMESTIC: 4 Families                                             Diversion Limit:           acft. PERIOD OF USE: 01/01 TO 12/31
-------------------------------------------------------------------------------------------------------------------------------------
OTHER COMMENTS***********************************************************************************************************************
-------------------------------------------------------------------------------------------------------------------------------------
     The applicant has a lease agreement with D.H. Adams for 50 years with a option
     to renew.
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII E N D   O F   D A T A IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                       XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO E N D   O F   D A T A OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
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UTAH DIVISION OF WATER RIGHTS

WELLPRT Well Log Information Listing

Version: 2002.04.04.00 Rundate: 12/06/2002 10:11 AM

Utah Division of Water Rights

Water Well Log

LOCATION:
N 2700 ft W 100 ft from SE CORNER of SECTION 25 T 6N R 6W BASE SL Elevation: feet

DRILLER ACTIVITIES:
ACTIVITY # 1 NEW WELL
DRILLER: Lee & Sons Drilling LICENSE #: 11
START DATE: 09/07/1972 COMPLETION DATE: 12/15/1972

BOREHOLE INFORMATION:

Depth(ft) From	To	Diameter(in)	Drilling Method	Drilling Fluid
0	200	8	CABLE	

LITHOLOGY:

Depth(ft) From	To	Lithologic Description	Color	Rock Type
0	5	CLAY,SAND		
5	74	CLAY,BOULDERS		
74	178	OTHER		BEDROCK
178	198	OTHER		BEDROCK FRACT.
198	200	OTHER		BEDROCK SOLID

WATER LEVEL DATA:

Date	Time	Water Level (feet) (-)above ground	Status
12/15/1972		169.00	STATIC

CONSTRUCTION - CASING:

Depth(ft) From	To	Material	Gage(in)	Diameter(in)
0	200		.250	8

CONSTRUCTION - SCREENS/PERFORATIONS:

Depth(ft) From	To	Screen(S) or Perforation(P)	Slot/Perf. siz	Screen Diam/Length Perf(in)	Screen Type/# Perf.
180	195	PERFORATION	.25	1.50	150

WELL TESTS:

Date	Test Method	Yield (CFS)	Drawdown (ft)	Time Pumped (hrs)
12/15/1972	BAILER TEST	.058		.30

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UTAH DIVISION OF WATER RIGHTS

WRPRINT Water Right Information Listing

Version: 2002.07.10.00 **Rundate: 12/06/2002 10:09 AM**

Water Right 13-1947

Select Related Information

```
[WRPRINT] ***WR#: 13 1947 has been PRINTED!!
                         (WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/06/2002  Page 1
WRNUM: 13-1947      APPLICATION/CLAIM NO.:              CERT. NO.:
----------------------------------------------------------------------------------------------------------------------------------
OWNERSHIP*************************************************************************************************************************
----------------------------------------------------------------------------------------------------------------------------------
NAME: Young Resources Limited Partnership                             OWNER MISC:
ADDR: 4990 North Highway 38
CITY: Brigham City                    STATE: UT  ZIP: 84302      INTEREST: 100%
LAND OWNED BY APPLICANT?
----------------------------------------------------------------------------------------------------------------------------------
DATES, ETC.***********************************************************************************************************************
----------------------------------------------------------------------------------------------------------------------------------
FILING:       / /    |PRIORITY:  00/00/1930|ADV BEGAN:   / /     |ADV ENDED:    / /     |NEWSPAPER:
PROTST END:  / /    |PROTESTED: [   ]      |APPR/REJ:  [          ]|APPR/REJ:    / /     |PROOF DUE:    / /    |EXTENSION:     / /
ELEC/PROOF:[        ]|ELEC/PROOF:  / /     |CERT/WUC:  04/30/1968|LAP, ETC:     / /     |PROV LETR:    / /    |RENOVATE:      / /
PD Book No.  3  Type of Right: DIL    Status:        Source of Info: PDET  Map: 232      Date Verified: 08/02/1996  Initials: JPJ
----------------------------------------------------------------------------------------------------------------------------------
LOCATION OF WATER RIGHT***********************************************************************************************************
----------------------------------------------------------------------------------------------------------------------------------
FLOW: 0.015 cfs                                  SOURCE: Underground Water Well
COUNTY: Box Elder    COMMON DESCRIPTION:
POINT OF DIVERSION -- UNDERGROUND:
(1) S 1600 ft E 1000 ft from NW cor, Sec 29, T  6N, R  5W, SLBM DIAM:    ins. DEPTH:      to      ft. YEAR DRILLED:      WELL LOG?
         Comment:
----------------------------------------------------------------------------------------------------------------------------------
USES OF WATER RIGHT***************************************************************************************************************
----------------------------------------------------------------------------------------------------------------------------------
CLAIMS USED FOR PURPOSE DESCRIBED: 1947,2072
     Referenced To:            Claims Groups:                       Type of Reference -- Claims:    Purpose:     Remarks:
..................................................................................................................................
  ###STOCKWATERING: 810 Cattle or Equivalent                         Diversion Limit:      22.68 acft. PERIOD OF USE: 01/01 TO 12/31
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII E N D   O F   D A T A IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                       XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
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UTAH DIVISION OF WATER RIGHTS

WRPRINT Water Right Information Listing

Version: 2002.07.10.00 **Rundate: 12/06/2002 10:08 AM**

Water Right 13-3733

Select Related Information

```
[WRPRINT] ***WR#: 13 3733 has been PRINTED!!
                                   (WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/06/2002  Page 1
WRNUM: 13-3733      APPLICATION/CLAIM NO.: A72115       CERT. NO.:
-------------------------------------------------------------------------------------------------------------------------------------
OWNERSHIP****************************************************************************************************************************
-------------------------------------------------------------------------------------------------------------------------------------
NAME: Young Resources Ltd. P                                      OWNER MISC:
ADDR: 4990 North Highway 38
CITY: Brigham City                    STATE: UT  ZIP: 84302       INTEREST:
LAND OWNED BY APPLICANT? Yes
-------------------------------------------------------------------------------------------------------------------------------------
DATES, ETC.**************************************************************************************************************************
-------------------------------------------------------------------------------------------------------------------------------------
FILING:    05/03/1999|PRIORITY:  05/03/1999|ADV BEGAN: 05/26/1999|ADV ENDED: 06/02/1999|NEWSPAPER:  The Leader
PROTST END:06/22/1999|PROTESTED: [No ]     |APPR/REJ:  [Approved]|APPR/REJ:  08/13/1999|PROOF DUE: 08/31/2008|EXTENSION:     /  /
ELEC/PROOF:[        ]|ELEC/PROOF:  /  /    |CERT/WUC:     /  /   |LAP, ETC:     /  /   |PROV LETR:    /  /   |RENOVATE:      /  /
PD Book No.     Type of Right: APPL  Status: APP   Source of Info: APPL  Map:          Date Verified: 05/11/1999  Initials: JMJ
-------------------------------------------------------------------------------------------------------------------------------------
LOCATION OF WATER RIGHT**************************************************************************************************************
-------------------------------------------------------------------------------------------------------------------------------------
FLOW: 1.73 acre-feet                                    SOURCE: Underground Water Well
COUNTY: Box Elder    COMMON DESCRIPTION: Promontory Point
POINT OF DIVERSION -- UNDERGROUND:
(1) S  535 ft E 2112 ft from NW cor, Sec 20, T  6N, R  5W, SLBM DIAM:  8 ins. DEPTH:  100 to  400 ft. YEAR DRILLED:      WELL LOG?
         Comment:
-------------------------------------------------------------------------------------------------------------------------------------
PLACE OF USE OF WATER RIGHT**********************************************************************************************************
-------------------------------------------------------------------------------------------------------------------------------------
                              NORTH-WEST4       NORTH-EAST4       SOUTH-WEST4       SOUTH-EAST4
                              NW NE SW SE       NW NE SW SE       NW NE SW SE       NW NE SW SE
Sec 20 T  6N R  5W SLBM     *  : X:  :  *     *  :  :  :  *     *  :  :  :  *     *  :  :  :  *
-------------------------------------------------------------------------------------------------------------------------------------
USES OF WATER RIGHT******************************************************************************************************************
-------------------------------------------------------------------------------------------------------------------------------------
```

```
CLAIMS USED FOR PURPOSE DESCRIBED: 3733
     Referenced To:            Claims Groups:                          Type of Reference -- Claims:    Purpose:    Remarks:
.....................................................................................................................................
  ###STOCKWATERING: 61 Cattle or Equivalent                             Diversion Limit:           acft. PERIOD OF USE: 01/01 TO 12/31
-------------------------------------------------------------------------------------------------------------------------------------
APPLICATIONS FOR EXTENSIONS OF TIME WITHIN WHICH TO SUBMIT PROOF*********************************************************************
-------------------------------------------------------------------------------------------------------------------------------------
FILING:    08/20/2002|PUB BEGAN:   / /     |PUB ENDED:   / /     |NEWSPAPER:
PROTST END:  / /    |PROTESTED: [        ]|APPR/REJECT[Approved]|APPR/REJ:  09/30/2002|PROOF DUE: 08/31/2008
-------------------------------------------------------------------------------------------------------------------------------------
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII E N D   O F   D A T A IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
000000000000000000000000000000000000000000000000000000 E N D   O F   D A T A 000000000000000000000000000000000000000000000000000000
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UTAH DIVISION OF WATER RIGHTS

WELLPRT Well Log Information Listing

Version: 2002.04.04.00 Rundate: 12/06/2002 10:09 AM

Utah Division of Water Rights

Water Well Log

LOCATION:

S 535 ft E 2112 ft from NW CORNER of SECTION 20 T 6N R 5W BASE SL Elevation: feet

DRILLER ACTIVITIES:

ACTIVITY # 1 NEW WELL
DRILLER: NELSON DRILLING COMPANY LICENSE #: 596
START DATE: 11/08/1999 COMPLETION DATE: 11/09/1999

BOREHOLE INFORMATION:

Depth(ft) From	To	Diameter(in)	Drilling Method	Drilling Fluid
0	20	12.2	AIR ROTARY	NONE
20	240	7.87	AIR ROTARY	NONE

LITHOLOGY:

Depth(ft) From	To	Lithologic Description	Color	Rock Type
0	2	LOW-PERMEABILITY,OTHER	BRN	OVERBURDEN
2	38	LOW-PERMEABILITY,CLAY,GRAVEL		
38	73	LOW-PERMEABILITY,OTHER	RED	SOFT SHALE
73	139	LOW-PERMEABILITY,OTHER	RED	HARD SHALE
139	162	LOW-PERMEABILITY,OTHER	RED	SOFT SHALE
162	240	LOW-PERMEABILITY,OTHER	RED	HARD SHALE
		NOT A DROP OF WATER, NOT EVEN ANY DAMP GROUND.		

WATER LEVEL DATA:

Date	Time	Water Level (feet) (-)above ground	Status
11/09/1999		.00	

CONSTRUCTION - CASING:

Depth(ft) From	To	Material	Gage(in)	Diameter(in)
+1	20	STEEL A 53	.250	8

CONSTRUCTION - FILTER PACK/ANNULAR SEALS

Depth(ft) From	To	Material	Amount	Density(pcf)
0	20	BENTONITE PELLETS		500

GENERAL COMMENTS:

CONSTRUCTION INFORMATION:
Well Head Configuration: dry well
Casing: pulled casing & plugged hole
ADDITIONAL DATA NOT AVAILABLE

APPENDIX F
CULTURAL AND ENVIRONMENTAL

AQUA ENGINEERING, INC.

APPLIED ECOLOGICAL SERVICES, INC.
APPLIED GIS

Clock Tower Plaza, Suite 302, 550 North Main Street, Logan, Utah 84321
Telephone(s): (435) 753-7006 &753-7027
Fax: (435) 753-2053, Email: aes@aeserv.com

June 19, 2003

Mr. Chet A. Hovey, Project Engineer
AQUA Engineering, Inc.
533 West 2600 South, Suite 275
Bountiful, Utah 84010

Dear Mr. Hovey:

This letter is written as support and clarification of information contained in the Environmental Assessment prepared for the proposed landfill at Promontory Point. Comments in this letter refer to categories listed in **Chapter IV: Environmental Consequences.**

4.1.6 Wildlife

The numbers and species of wildlife found in this area are very limited because of lack of any surface water. Birds are very mobile and as such would not be impacted by this development. The variety of small mammals and reptiles that are found in this landfill valley (2,000 acres) are actually widespread in their range on Promontory which includes over 100,000 acres. At any given time, less than 25 acres of habitat would be disturbed in the landfill area. This would not impact any populations of these species found in the landfill area.

State and Federal Agency review of the wildlife and habitat situation at the landfill location was carried out in June of 2003. This involved a field trip with Pam Kramer, Habitat Biologist, Utah Division of Wildlife Resources, and Chris Witt, Biologist, U.S. Fish and Wildlife Service. Both the State and Federal Wildlife Agencies will be sending their comments in writing to Dr. Workman for a formal response to the following questions asked by them. A review of these issues include the following:

1. California gulls and white pelicans:

Question: Would the landfill attract more gulls to the area which in turn would harm pelican rookeries on Gunnison Island of the Great Salt Lake?

Response: Gulls in the vicinity of the proposed landfill would not influence pelican nesting because of the following: Gulls are already found on Gunnison Island, the main pelican nesting area. Also, there are other gull nesting areas nearby on Egg Island and White Rock in the Great Salt Lake. Subsequently, this project should not bring any additional gulls to the Gunnison Island pelican nesting area.

In a similar situation on south end of Utah Lake (Goshen Bay), there was a concern that the landfill at Elberta would attract more gulls to their landfill area. This did not occur as a small resident population of gulls in that area is all that came to the new landfill area.

The main reason for gull populations not increasing in the vicinity of new landfills, is because the area that is open on these landfills at any given time is 1/4 acre or so, and this is covered daily. This limited "feeding" area does not attract large numbers of gulls.

Question: Would the landfill attract more gulls to the area which in turn could impact birds at Bear River Bird Refuge?

Response: Bear River Bird Refuge is located over the top of Promontory Mountain to the east, and across Bear River Bay. This puts geographical barriers and distance in between the proposed landfill and the Refuge. As stated in the response given in the former question, the gull populations will not increase in the vicinity of the proposed landfill as the area that is open on these landfills at any given time is 1/4 acre or so, and this is covered daily.

4.1.7 Threatened, Endangered, Candidate or Sensitive Species (of wildlife):

There are no resident species of threatened, endangered, candidate or sensitive species of wildlife found in the vicinity of the proposed landfill. Peregrine falcons, golden eagles, and bald eagles are highly mobile and may actually fly across the proposed landfill area. However, their habitat is not here but rather in areas such as the Bear River Bird Refuge and marshes on the east side of Promontory. There are no resident species of threatened, endangered, candidate or sensitive species of mammals or reptiles that are found on Promontory Point.

2. Threatened, Endangered, Candidate or Sensitive Species (of wildlife)

Question: Are there any Threatened, Endangered, Candidate or Sensitive Species in the vicinity of the proposed Promontory landfill?

Response: In review of research on the flora and fauna of Promontory Point, there were no plants or animals that were categorized as Threatened, Endangered, Candidate or Sensitive on Promontory Point which includes the proposed landfill area.

4.1.9 Cultural Resources

Question: Are there any archaeological resources that could be destroyed by construction of the proposed landfill. Also, is this designated as a special or sacred area by the Shoshoni Indians?

Response: This topic is addressed in the Environmental Assessment on the site. This query was directed to Mr. Bruce Perry, Northwestern Band of the Shoshoni Tribe; Mr. James L. Dykmann, Compliance Archaeologist, State of Utah, Department of Community and Economic Development, Division of State History, Utah State Historical Society; and Dr. Brooke S. Arkush, Archaeologist, Department of Sociology and Anthropology, Weber State University.

Mr. Perry deferred his comments to the State opinion. This was also the position of Dr. Arkush. The State response was:

> "The Utah State Historic Preservation Office has reviewed our cultural resource files for the above requested project area. No known historic properties have been recorded within the project area because no historic properties' surveys have been conducted."

In the opinion of Mr. Ralph Bohn and Mr. Carl Wadsworth of the Utah Department of Environmental Quality, Division of Solid and Hazardous Waste, the statement by Mr. Dykmann indicates that no artifact evidence has ever been found in the vicinity of the proposed landfill and therefore no surface archaeology inventory is required for the site by the Department of Environmental Quality office for the proposed Promontory Point landfill project.

One additional concern that Pam Kramer, Habitat Biologist, Utah Division of Wildlife Resources had related to rehabilitation of the site as each cell or area is filled. This will be taken care of by providing soil over the area suitable for planting existing species. In this case, the State Division of Natural Resources will be asked to recommend a seed mix for this area that would be suitable for wildlife.

If additional information is needed on these subjects in relation to the proposed landfill, please let me know.

Sincerely,

Gar W. Workman, PhD
Program Administrator

APPLIED ECOLOGICAL SERVICES, INC.
APPLIED GIS

Clock Tower Plaza, Suite 302, 550 North Main Street, Logan, Utah 84321
Telephone(s): (435) 753-7006 & 753-7027
FAX: (435) 753-2053

Gar W. Workman, PhD

Education: Associate of Science, Zoology, English; B.S. Fisheries & Wildlife Management; M.S. Aquatic Biology; Ph.D. Ecology.
Work experience: Biologist, Utah Division of Wildlife Resources; Fish and Wildlife Extension Specialist, Federal Extension Service, Utah State University; Senior Scientist, Utah State University Foundation; Program Administrator, Applied Ecological Services (current).
Publications: 200 + publications, including 30 reports (5000+ pages) for the U. S. Air Force.
General studies: Research on the prairie dog, ring-tailed cat, beaver, raptors, sharp-tailed grouse, reptiles, various fish, flying squirrels, threatened endangered fish, elk, antelope, bighorn sheep, sheep genetics, gulls, pelicans, etc. (Other: 28 EIS and Assessments).
Air Force studies included research relating to the effect of sonic booms and other disturbances on wildlife including elk, bighorn sheep, and antelope. Also, natural resource management plans, ecological studies on gulls, pelicans, raptors, small mammals, threatened and endangered species, and directed research on entomology, outdoor recreation plans, revegetation studies, geology surveys, historical and descriptive studies of Air Force Structures, and archaeological projects.
Other research conducted with the Utah Division of Wildlife Resources, Idaho Fish and Game Department, Welder Wildlife Foundation, Bureau of Indian Affairs, National Science Foundation, U. S. Forest Service, Bureau of Land Management, Corps of Engineers, Bureau of Reclamation, National Oceanic and Atmospheric Administration, Atomic Energy Commission, National Park Service, U. S. Army, U. S. Air Force, and the Government of Cyprus, Red Hawk Land Development, Wendover, Nevada.
Positions held: President of the Utah Chapter of the Wildlife Society; President of the Bonneville Chapter of the American Fisheries Society; President of the Utah Academy of Science, Arts and Letters; Director of Bear Lake Laboratory; Vice President of W. F. Sigler and Associates, Inc.; Program Administrator of Applied Ecological Services, Inc.; Member of Advisory Board of Canyonlands National Park; Advisor to National Oceanic and Atmospheric Administration project on the outer continental shelf of Alaska; consultant to various corporations, agencies and utility companies on fisheries, wildlife and other natural and cultural resource projects.
Location of projects: Alaska, various states in the United States, Mexico, Cyprus.

June 23, 2003

Mark Easton
Solid Waste Director
1515 West 2200 South, Suite C
Salt Lake City, Utah 84074

Dear Mr. Easton,

The Fish and Wildlife Service (Service) has reviewed the materials included with your letter of June 3, 2003 regarding the Promontory Point Landfill Project. The project as proposed would construct and operate a municipal landfill on Promontory Point, Box Elder County, Utah. Waste would be carried to the site via rail car or truck from municipalities located along the Wasatch Front at a rate exceeding 1200 tons per day, for a period of 60 to 80 years. The landfill would not accept any hazardous, septic, sump, or chemical waste during the life of the landfill. Based on conversations during the site visit and contrary to the written proposal, a total of four monitoring wells would be installed to monitor groundwater within the footprint of the landfill, rather than three. The additional well would be down slope of the project area. We are providing the following comments for your consideration in your project.

The Service believes that a site specific wildlife analysis should be conducted. The analysis provided in the proposal is too general and can be misleading in that it lists several species as "found in the area" that are highly unlikely to be present and excludes some that were present during our site visit. Sagebrush was not included in the list of plant species under "Site Description" and was only listed as a dominant "shrub type" under "Vegetation" yet sagebrush was the dominant *plant* type and *community* type within the footprint of the project that was observed during the site visit. It is extremely important to have accurate resource accounts in order to properly assess the impacts of the project on wildlife.

The Service recommends a plan that would maximize the wildlife value of the buffer strip surrounding the landfill. The site visit showed a large amount of sagebrush habitat that was being currently used by a variety of wildlife, including black-tail jackrabbit, coyote, mule deer, northern sagebrush lizard, turkey vulture, ground squirrel, and mourning dove. Not only could this buffer area provide valuable habitat during the life of the project, it could be an important seed/colonization source for plants and wildlife after the landfill has been reclaimed.

The Service is concerned with the potential impacts the landfill may have on nearby gull and pelican colonies. Specifically, we are concerned the landfill may act as an attractant for gulls and this may result in an increase in pelican predation at the nearby rookery. We recommend a literature review to see what similar impacts may have occurred at other landfills and what measures were taken in those instances to mitigate impacts.

We suggest that the proponent explore the use of non-lethal barriers for excluding gulls and other birds and wildlife from exposed evaporation ponds. Specifically, the use of netting may be a practical means to keep volant wildlife from using the ponds. Mesh size should be carefully considered to avoid injury or death of birds and bats that may be using the area.

It is unclear whether site-specific soil analysis has been or will be done. The document provided to us states that soil data was taken from a 1975 USDA SCS document that covers the eastern part of Box Elder County. Site-specific geology and soil type may be important to accurately model subsurface flow of potential contaminants.

The Service strongly recommends that waste be bailed or otherwise contained prior to transport to the proposed facility and that a monitoring protocol be developed to assess the amount of waste escaping the landfill and subsequently landing in the Great Salt Lake. There are a multitude of common trash items known to be deadly to birds and other wildlife. Any means by which to reduce exposure of these items to wildlife would improve the project.

Thank you for the opportunity to comment on this project and for the time you took to accommodate a site visit. If we can be of further assistance, or if you have any questions, please feel free to contact Chris Witt of our office at (801) 975-3330 extension 133.

Sincerely,

Henry R. Maddux
Utah Field Supervisor

cc: UDWR - Ogden

bcc: Project file;
Reading file

file: Z:/Witt/Promontory_Landfill_062303

P.O. Box 278
Rockland, ID 83271
July 15, 2003

Mr. Chet A. Hovey, Project Engineer
AQUA Engineering, Inc.
533 West 2600 South, Suite 275
Bountiful, UT 84010

RE: Wildlife Concerns - Proposed Promontory Point Landfill

While serving as the Assistant and Acting Leader of the Utah Cooperative Wildlife Research Unit at Utah State University during the 1960's and 1970's, I became well acquainted with Promontory Point. One of our students (Fritz Knopf) conducted a study on the nesting colony of white pelicans (Pelicanus erythrorhynchos) on Gunnison Island in the northwest arm of the Great Salt Lake. I also have visited Promontory Point on several occasions during recent years - in relation to proposed projects in that area.

It is my understanding that the proposed landfill project area would involve 1,000 acres plus a 1,000-acre buffer area. Also, that at any given time there will be less than 10 acres impacted, and the actual face on the landfill will be approximately 100 feet long. Additionally, the landfill material will be covered daily and will be surrounded by a fence.

The proposed project area has relatively very little value for wildlife. Fill for the railroad causeway across the north end of the Great Salt Lake was extracted from this area by the Morrison-Knudson Construction Company and it essentially was left as a huge, open pit. This rocky area has very little soil and vegetation on it is limited primarily to sparse stands of cheat and galleta grass, with some grease wood at the bottom and a little sagebrush in the upper reaches. Furthermore, the area is subject to periodic fires and surface water is virtually absent. In short, it is my professional opinion that it would be difficult to find a suitable area for a landfill that would result in less impact upon wildlife or other environmental values as does the proposed project area.

Nesting colonies of gulls and pelicans have co-existed on Gunnison Island (approximately 6 miles to the NW of the proposed project area) for many years. With the face of the landfill being only about 100 feet long and the material being covered daily, gull populations should not be significantly increased. Activity on the face of the landfill and frequent covering of waste materials should deter much gull activity or feeding on the area. Thus, I believe adverse impacts upon the Gunnison Island white pelican rookery (i.e. from increased gull predation) would be minimal. Furthermore, the pelican nesting area is sufficiently isolated and distant from the proposed project area that there should be no negative impacts upon the pelicans from human activities associated with the landfill.

It is my understanding that the proposed landfill would not accept any hazardous or chemical wastes. And, four wells would be installed to monitor groundwater within and adjacent to the project area. Further, it also is my understanding that municipal wastes will be transported to the site in the same manner in which they are now transported to the landfill areas near Price, Utah, i.e. loaded and compacted into box cars by heavy equipment. If this is the case, there should be little, if any, contamination or littering of the railroad right-of-way nor of the adjacent Great Salt Lake as a result of the transportation process.

If there are any questions with regards to my comments or if I can be of further assistance, please feel free to contact me at (208) 548-2468.

Sincerely,

J. Juan Spillett

J. Juan Spillett, Sc.D.
Consulting Wildlife Ecologist

VITA

James Juan Spillett
Consulting Wildlife Ecologist

Permanent Address: P.O. Box 278, Rockland, ID 83271
Phone: (208) 548-2468

Date & Place of Birth: October 21, 1932, Idaho Falls, Idaho

Secondary Education: Griswold High School, Helix, Oregon
Rockland High School, Rockland, Idaho

Collegiate Education & Degrees:
Utah State University - B.S. 1961, Wildlife Management
Central Univ., Quito, Ecuador - Fulbright Scholar 1961-2
Utah State University - M.S. 1965, Wildlife Biology
Johns Hopkins Univ. - Sc.D. 1968, Animal Ecology, Animal Behavior & Medical Entomology

Professional Experience:
Seasonal Naturalist - U.S. Park Service (WY, NM & CO) 1958-61
Asst. & Acting Ldr. - Utah Coop Wildlife Research Unit 1967-76
Assoc. Prof.- Dept. Wildlife Resources, Utah State Univ. 1967-76
Proj. Ldr. - Int'l Sheep & Goat Inst. & Iran Min. Agric. 1976-78
Forest Biologist - Uinta Nat'l Forest, Provo, UT 1978-1980
Assoc. Prof. - Dept. Wildlife Science, Texas A&M Univ. 1980-82
Forest Biologist - Caribou Nat'l Forest, Pocatello, ID 1982-90
Proj. Ldr. - Denver WL Research Center (Chad, Africa) 1990-2
Forest Biologist - Uinto Nat'l Forest, Provo, UT 1992-94

As a Fulbright Scholar in Ecuador, I compiled "A Guide to the Mammals of Ecuador". I then spent 18 months in the Red Desert of WY conducting my M.S. research on "The Effects of Livestock Fences on Pronghorn Antelope Movements". Thereafter, I spent 2 years in India, during which I conducted my doctoral research on "The Ecology of the Lesser Bandicoot Rat in Calcutta", which was published in book form by the Bombay Natural History Society and the Rockefeller Foundation. I also conducted wildlife surveys throughout much of India and in central Nepal under the auspices of the World Wildlife Fund, Morges, Switzerland & The Johns Hopkins Univ. I assisted the National Geographic Society with a feature article on "India Strives to Save Her Wildlife". And, I have authored or co-authored more than 100 scientific articles, published in periodicals or journals, i.e. Journal of Wildlife Management, Journal of the Bombay Natural History Society, Journal of Mammalogy, and Journal of Animal Science. I served as editor of the Desert Bighorn Council Transactions for 3 years, and fequently edit contributions to various journals or periodicals.

As an Assoc. Prof. in the Depts. of Wildlife Science at Utah State and Texas A&M Universities, I taught courses in Principles of Wildlife Mgmt., Wildlife Habitat Mgmt., Wildlife Techniques, and conducted undergraduate and graduate seminars. Most of my time, however, was spent in developing and supervising graduate student research projects. More than 30 students received graduate degrees under my supervision. Although I retired from federal service in 1994, I serve as an Adjunct Professor at Brigham Young University and the University of Idaho. I also have served as a consultant on projects in Bolivia, Honduras, Macedonia and the U.S. I am particularly interested in working and assisting in projects related to wildlife conservation, i.e. the "wise-use" of natural resources.

P-III Associates, Inc.
Cultural Resource Consultants

2759 South 300 West, Suite A
Salt Lake City, Utah 84115-2955
(801) 467-5446

August 5, 2003

Mr. Michael J. Forrest
Special Projects
Pacific West LLC
1515 South 2200 West, Suite C
Salt Lake City, UT 84119

RE: Cultural resources reconnaissance of the Promontory Landfill Area in Box Elder County. Cultural Resources Report 5204-01-20311.

Dear Mr. Forrest:

As per the subcontract agreement between Pacific West and P-III Associates (dated July 16, 2003), our firm conducted a cultural resources reconnaissance of approximately 2000 acres of private land associated with the Promontory Landfill project in Box Elder County. A cultural resources reconnaissance inventory is designed to identify major archeological sites in the area. One major archeological site was found in the parcel. This site is located within the 2000-acre buffer zone and will not be impacted by landfill activities.

Prior to the fieldwork, P-III Associates staff archeologist Greg H. Miller conducted a file search at the State Historic Preservation Office on July 15, 2003 to determine if any previously recorded sites or properties existed within the project area. The file search did not identify any previously recorded sites within the project area, although a number of known important cave and rockshelter sites have been recorded in and around the Promontory region.

On July 25, 2003, two staff archeologists from P-III Associates conducted reconnaissance of the entire project area. Using a four-wheel-drive vehicle, the crew did a brief visual reconnaissance of the project area and then stopped and performed on-foot inspections of areas of high relief in the eastern and western parts of the parcel, searching for rock art, prehistoric caves and rockshelters, historic mining camps, and any other type of cultural resource site. One archeological site was discovered by the crew. This site is a small rockshelter overlooking Gunnison Bay to the west. The site consists of a rockshelter located in a quartzite outcrop and an associated midden. The shelter measures 5.0 m deep by 2.4 m wide by 2.0 m high and the entrance faces southwest at a 220° azimuth. Approximately 20 pieces of obsidian debitage (mostly bifacial thinning flakes), 1 gray chert core reduction flake, and a small projectile point (likely a Desert Side-notched) were noted on the surface of the midden. The only artifact visible within the shelter itself is an obsidian bifacial thinning flake. The midden extends out approximately 5 m from the shelter entrance and appears to be at least 1 m deep. The shelter roof appears to exhibit smoke blackening. This site is located on the eastern edge of the high-relief area. It is in excellent condition, is undisturbed, and has not been looted because the site is not visible from the road that passes below. Evaluation by our field team suggests that the site contains information that is significant to the Protohistoric period and earlier times of prehistoric occupation. This site is potentially eligible for inclusion in the National Register of Historic Places (NRHP).

Because the site is potentially eligible for inclusion in the NRHP, measures should be taken to protect it from any damage during construction and use of the landfill and to ensure that the site is not disturbed or looted. If the site cannot be protected in situ, it is recommended that a data recovery project be implemented to recover the significant archeological data.

We appreciate the opportunity to conduct this project for you. Please feel free to call me if you have any questions.

Sincerely,

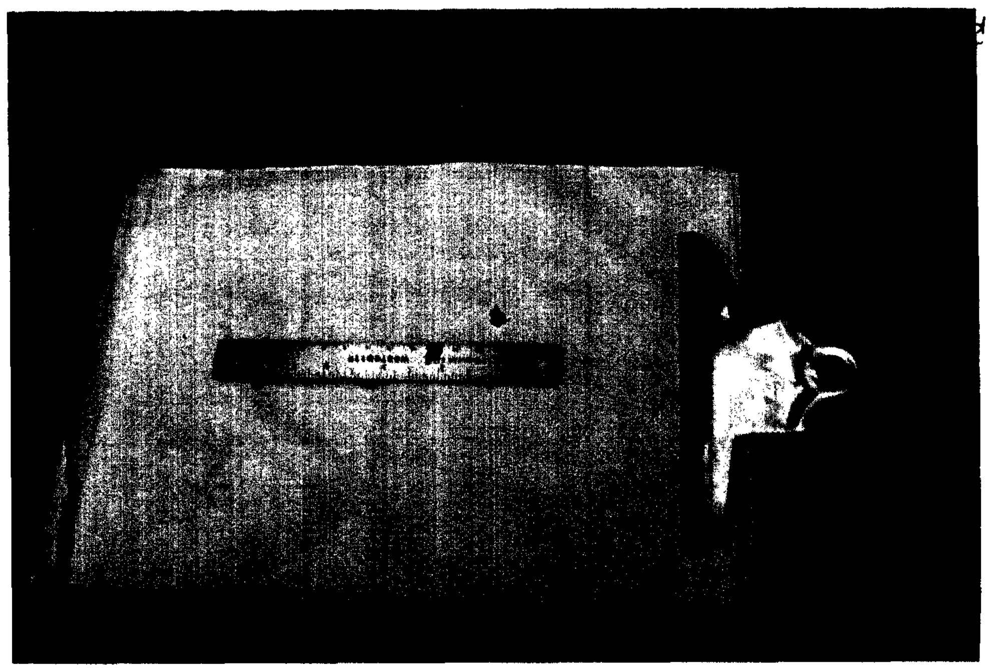
Alan R. Schroedl
Senior Consultant

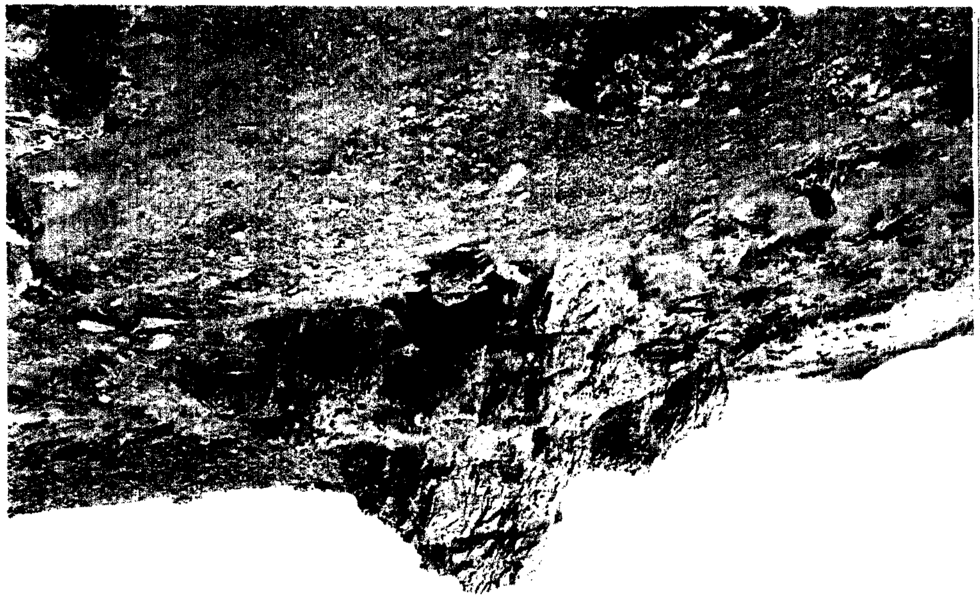
ARS/sel

Enclosure: Photos of rockshelter site
U.S.G.S. map showing the locations of the project area and the rockshelter

Rockshelter

5204-01-20311





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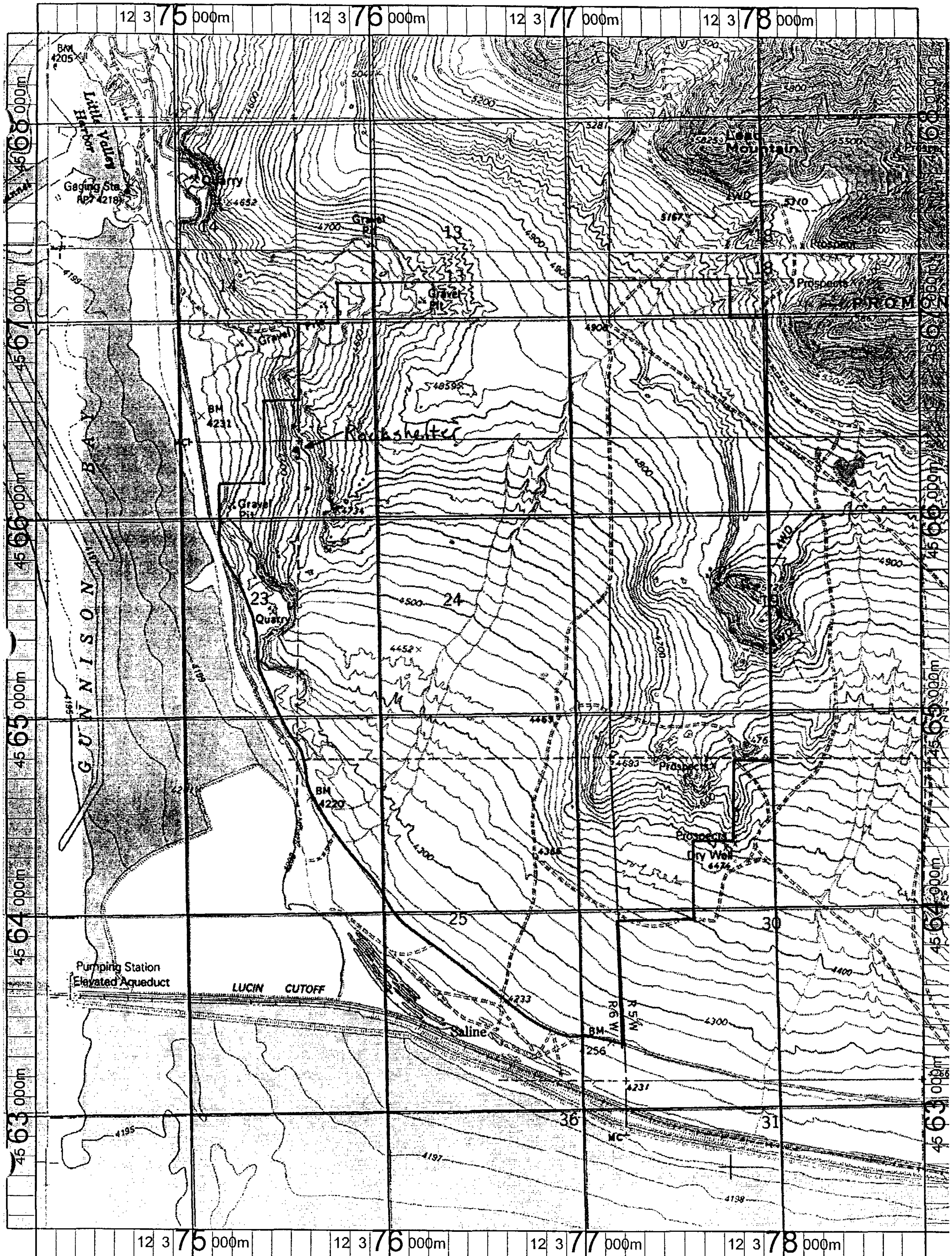
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Rockshelter
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FRONTIER CORPORATION USA
Environmental Consultants

MEMORANDUM

DATE: August 18, 2003

TO: Mike Forest, Pacific West LLC

FROM: Sarah G. Lupis, Wildlife Biologist
Dennis Wenger, Project Manager, Sr. Wetlands Ecologist

SUBJECT: Gulls, landfills, and pelicans: An assessment of potential landfill effects to the Gull and American White Pelican populations on Gunnison Island.
Literature Review and Technical Memorandum

INTRODUCTION

Frontier Corporation USA (Frontier) was asked to conduct a literature review and prepare a technical memorandum addressing the potential effects of landfills on gull populations and the potential impacts of increased gull abundance on nearby nesting bird colonies. Specifically, this report addresses the potential for increased gull (*Larus* spp.) predation on the American white pelican (*Pelecanus erythrorhynchos*) colony on Gunnison Island in the Great Salt Lake resulting from development of a proposed municipal solid waste landfill on Promontory Point, Utah.

An online literature search was conducted through the Utah State University (USU) library system. Journal databases searched included: Wildlife Worldwide, AGRICOLA, and Ecological Abstracts. Databases were queried using keywords such as gull, landfill, dump, predation, and pelican on their own and in combination. Relevant material was obtained from the USU Science and Technology Library in Logan, Utah.

Several authors reported that gulls use landfills for foraging, loafing, and social interactions (Belant et al. 1988, Belant et al. 1995, Belant et al. 1993, Patton 1988, Harris 1970). Several factors contribute to the use of landfills by gulls including landfill management techniques, migratory patterns, age of gull, gull sex, and proximity of landfill to potential nesting and staging habitat.

Gulls are opportunistic predators and scavengers. They have been known to prey on eggs and young of waterfowl and shorebird species including: ducks, terns, cormorants, oystercatchers, several species of geese, and pelicans (Schmutz et al. 2001, Belant 1997, Yorio and Quintana 1997, Harris and Wanless 1997, Guillemette and Brousseau 1991, Braun et al. 1980, Anderson 1965, Behle 1935). The degree to which gull predation limits populations of nesting waterfowl and shorebirds is still being debated in the literature.

The first account of nesting pelicans in the Great Salt Lake are from the exploration party lead by Howard Stansbury in 1850 (Parrish et al. 2002 and Behle 1935). Historically, pelicans nested on Egg Island, Badger Island, Gunnison Island, and Hat Island (Parrish et al. 2002 and Behle 1935). Today, Gunnison Island is the only home to breeding pelicans in the state of Utah and has been identified as one of the three most stable and reproductive breeding sites on the continent (Parrish et al. 2002). No studies or reports were found that indicate why pelican colonies have disappeared from the other islands in the Great Salt Lake. Although many other North American pelican colonies have experienced declines due to water diversion and human disturbance since the 1970s, the Gunnison Island breeding population has increased slightly during this time (Parrish et al. 2002).

Frontier did not find any definitive studies on the effects of landfills on gull predation in the Great Salt Lake. Several authors agree that site specific studies should be conducted to determine the effects of landfills on gull populations and their impact to nesting waterfowl and shorebirds because of unique characteristics of individual landfills and the biotic communities they potentially impact (Belant et al. 1995, Belant et al. 1993). Frontier attempted to summarize readily available literature on the use of landfills by gulls and the impact gull predation has on waterfowl and shorebird species, specifically the American white pelican. The conclusions presented in this report are intended to serve as a general guide for land management decisions on Promontory Point and should not be considered an authoritative study on the subject.

ARE GULLS ATTRACTED TO LANDFILLS?

Several studies have documented the attraction of various species of gull to landfills in North America and Europe (Belant et al. 1988, Belant et al. 1995, Belant et al. 1993, Patton 1988, Harris 1970). The available literature included observations on ring-billed gulls (*Larus delawarensis*), herring gulls (*L. argentatus*), laughing gulls (*L. atricilla*), lesser black-backed gulls (*L. fuscus*), and California gulls (*L. californicus*). Belant et al. (1995) reported that gulls comprised 94.5% of the birds recorded at landfills in northern Ohio. Patton (1988), observed over 90,000 gulls foraging at seven Tampa Bay area landfills during January and February. Similarly, 91% of all birds recorded at a landfill in Cuyahoga County, Ohio, were gulls (Gabrey 1997).

Gulls may be attracted to landfills because they provide a constant food source. In many studies, food items found at landfills constituted a substantial component of gull diets. Belant (1998) reported that anthropogenic food items comprised 71% of food items collected at a herring gull colony in Ohio. The majority of those items were chicken parts. In the same study, 54% of food items from ring-billed gull pellets were anthropogenic in origin. Again, chicken parts were the primary item detected. Anthropogenic food items were the second most common food item found in gull chick boli (partially digested food material) (11%) and in food remains found at nest sites (17%) in Ohio (Belant et al. 1995). Items such as beans, strawberries, melons, corn, paper, cloth, and matches were found in the stomachs of gulls in California (Anderson 1965). Landfills may be used for activities other than foraging. Belant et al. (1993) noted that 62% of gull activity at landfills included loafing, alert posturing, and maintenance activities. Therefore, landfills seem to provide habitat for foraging as well as opportunities for social interactions although the primary attractant for gulls to visit landfills is probably foraging opportunities.

Use of landfills by gulls may vary seasonally. Seasonal changes in abundance of gulls at landfills may be related to migratory patterns. For example, gull numbers were five times greater in January and February at a Tampa Bay, Florida, landfill which coincides with their traditional migration patterns (Patton 1988

Seasonal use may be influenced by energetic requirements of nesting and chick-rearing adults. Use of landfills, in Cuyahoga County, Ohio, by adult herring gulls increased during the post-fledgling period (Belant et al. 1998). Herring gulls in this study used food resources, primarily fish, in Lake Erie almost exclusively during incubation, probably because fish is a higher quality food. Conversely, ring-billed gulls in this study maintained their use of landfills during incubation, chick-rearing, and post-fledgling, probably because they are more general in their food selection (Belant et al. 1998). Belant et al. (1995) also noted a decrease in herring gull attendance at Ohio landfills, near Lake Erie, during the breeding season and attributed that to an increased diet of fish during that time. Belant et al. (1993) also noted that herring gulls primarily eat fish during incubation and chick-rearing, but switch to anthropogenic foods during post-fledgling. Conversely, Pons (1992) reported that 71% of marked herring gulls used a landfill during incubation and chick-rearing. These results suggest that landfills may provide an easily obtainable, nutritionally adequate food source after the breeding season for some species, while providing a constant source of suitable food for other species throughout the breeding season. In addition, landfills may not be important food sources for gulls when alternate, high quality food, such as fish, is available. The abundance and availability of food items at landfills seem to be important foraging factors.

Within a population, gulls of different ages and sexes may exhibit different patterns of landfill use. Belant et al. (1993) reported that females used landfills more than males. The authors suggest that because females are less successful during aggressive foraging, it may be necessary for them to spend more time at landfills to provide an adequate amount of foraging opportunities. Belant et al. (1993) observed an increase in landfill use by adult and hatching-year gulls following fledgling. Patton (1988) reported that first-year laughing gulls were nearly absent from Tampa Bay, Florida landfills in July but comprised 17% of the gulls present from September-February. Belant et al. (1998) reported that landfill use was similar for adults and hatching-year herring gulls.

Landfill use by gulls may be influence by the proximity of the landfill to breeding and nesting sites and by the type of habitat surrounding the facility. Belant et al. (1995) noted that greater use of some landfills in their study was likely due to their proximity to Lake Erie, a nesting, staging, and wintering area for gulls. The authors conclude that increasing the distance of landfills from nesting and staging areas should reduce their use by gulls. Conover (1983) reported that many gull colonies in the western United States were located in close proximity to human settlements with associated landfills that provide new food sources. Thus, it seems that use of landfills by gulls is influenced by proximity of the landfill to established nesting and staging areas and, in addition, gulls are likely to establish nesting colonies near urban areas and their associated landfills.

Gulls have been reported to travel up to 36 km from nesting sites to landfills (Belant et al. 1995). Belant (1998) reported that gulls traveled to landfills 23, 26, and 30 km from nesting colonies. Gulls in Ohio traveled 19, 28, and 35 km from nesting colonies to feed at landfills. Gulls in Florida used landfills 22 km from nighttime roosting sites. Conover (1983) reported that 84% of gull colonies were withing 36 km of a town with >1000 people and 40% of colonies were located within 36 km of a town with >10,000 people. Conover (1983) surmised that large towns would contain landfills or other anthropogenic food sources.

Finally, landfill use is also influenced by management practices. Greater numbers of gulls used areas with exposed refuse than areas with recently covered refuse, and they used non-refuse areas the least (Belant et al. 1993). Completely incinerated waste buried at landfills appears to be unuseable by gulls (Patton 1988). Gabrey (1997) reported little gull activity at alternative waste-management sites including compost facilities, trash-transfer sites, and a construction and demolition landfill. The compost facilities received yard-waste material; the trash-transfer sites received household garbage in small, covered trucks through a garage door where it was unloaded and sorted; the construction and demolition landfill received construction and demolition waste such as cement and soil.

PREDATION BY GULLS

Large gulls (*Larus* spp.) are opportunistic predators and scavengers who eat a variety of food items including: insects, fish, grains, birds, small mammals, eggs, and young birds (Parrish et al. 2002, Schmutz et al. 2001, Guillemette and Brousseau 2001, Yorio and Quintana 1997, Harris and Wanless 1997, Braun et al. 1980, Anderson 1965, and Behle 1935).

Gulls will readily eat the eggs and chicks of other colonial nesting bird species if the opportunity of an unattended egg or chick is present. Schmutz et al. (2001) reported that gull diets in Alaska include goslings from several species of geese. The authors reported a correlation between increased gull numbers and decreased emperor goose gosling survival. Braun et al. (1980) observed herring gull predation on merganser ducklings. Odin determined that 18.3% of duck eggs at Farmington Bay Wildlife Management Area, in Davis County, Utah, were destroyed by California gulls. Finally, Parrish et al. (2002) report that California gulls are the primary predators of American white pelican young on Gunnison Island.

Gulls may limit reproductive success of other colonial nesting bird species. Guillemette and Brousseau (2001) reported greater breeding and nesting success of oystercatchers (*Haematopus ostralegus*) during periods of gull culling, indicating that gulls can limit the size of oystercatcher populations. Other accounts indicate that gulls are not significant predators of colonial nesting shorebirds and waterfowl. Only 2-3 egg predation events during the 1963 nesting season were attributed to gulls in a California study (Anderson 1965).

Predation may be a learned behavior in gulls. A study conducted in Patagonia, Argentina, on kelp gulls (*L. dominicanus*) and two tern species (*Sterna* spp.) reported that predation on tern eggs was restricted to only a few individual gulls at the periphery of the tern colony (Yorio and Quintana 1997). The authors suggest that perhaps certain individuals specialize in this type of feeding behavior. They suggest that eliminating those individuals may substantially reduce predation events.

PELICANS ON GUNNISON ISLAND

Gunnison Island is located in the Great Salt Lake, approximately 40 km from Promontory Point in Township 9 west, Range 7 north . The island is approximately 66 ha in size and contains a great deal of topographic relief and variation including bays, slopes, and sandy beaches. American white pelicans and California gulls are the primary colonial nesting species that inhabit the island. Because the Great Salt Lake is highly saline and does not support a fishery, both species must travel at least 48 km outside the Great Salt Lake to forage.

The only reports of gull predation on American white pelicans that were found were from Gunnison Island (Parrish et al. 2002 and Behle 1935). Behle (1935) recounts the observations of Emil Johnson, a local boatman, who observed a reduction in the number of nests with pelican eggs and young after a party of sightseers had been marooned on the island. Behle (1935) suggests that "...the adult pelicans were kept away from their nests for several hours by the marooned party, thus allowing the gulls to pillage eggs." Parrish et al. (2002) reports that California gulls are the primary source of predation to the Gunnison Island pelican colony, especially during disturbances, such as human presence and boat traffic, that leave chicks exposed, away from the nest.

Potential for Increased Predation

Based on the results of the literature review, there appears to be little information that would suggest a great potential for increased predation by California gulls on American white pelicans on Gunnison Island from the establishment of a landfill on Promontory Point.

Although the landfill would be located within foraging distance from the nesting colony on Gunnison Island, the gull population has access to many high quality foraging areas such as the Bear River Migratory Bird Refuge, state wildlife management areas, the Willard Spur arm of Bear River Bay, and nearby privately managed wetlands (Parish et al. 2002).

From the 1920s to 1980, while gull populations across the western United States increased by over 12 times (from 18,210 to 226,000), the population of California gulls on the Great Salt Lake only increased from 41,000 to only 50,000 individuals (Conover 1983). During this time period, the amount of breeding habitat for gulls has increased through the creation of reservoirs. In addition, there has been an increase in food resources due to increased human population (and associated landfills) and expanding agricultural practices. Despite more productive conditions, the California gull population on the Great Salt Lake has not experienced a great increase in numbers. This may be due to other limiting factors, such as the amount of available breeding habitat. Because gulls nest on islands, the amount of geographic space available to them for nesting is limited. Although development of a landfill at Promontory Point would provide an additional food resource, the California gull population on the Great Salt Lake would likely remain relatively stable because nesting habitat is limited.

Finally, the proposed landfill is not expected to increase human disturbance or boat traffic to Gunnison Island or the northern end of the Great Salt Lake. Disturbance seems to be the primary reason adult pelicans leave the nest, exposing eggs and chicks to predators. By avoiding disturbance, opportunities for predation by California gulls is minimized.

Management Recommendations

As stated in a previous section, gulls are less likely to forage at landfills where refuse has been covered (Belant et al. 1993). Management practices that minimize the amount of exposed waste will likely reduce gull foraging at landfills. However, gulls also used large, open areas with sparse vegetation at landfills for loafing and social interactions (Belant et al. 1993). Management practices should take into account the amount of undisturbed habitat available for loafing and other non-foraging activities. Additional lethal and non-lethal methods of harassment and control should remain viable under any land management plan to deal with unwanted gull attendance at landfills, especially those located near critical nesting habitat for colonial waterfowl and shorebird species.

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State of Utah

Department of Community and Economic Development
Division of State History
Utah State Historical Society

Michael O. Leavitt
Governor
Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182
(801) 533-3500 FAX: 533-3503 TDD: 533-3502
usha@history.state.ut.us http://history.utah.org

October 16, 2001

Gar W. Workman, Project Coordinator
Applied Ecological Services, Inc.
Clock Tower Building, STE 302
550 North Main
Logan UT 84321

RE: Landfill Development on the Southwest Corner of Promontory

In Reply Please Refer to Case No. 01-1596

Dear Mr. Workman:

The Utah State Historic Preservation Office has reviewed our cultural resource files for the above requested project area. No known historic properties have been recorded within the project area because no historic properties' surveys have been conducted.

A survey of the area may identify historic properties, some of which may be eligible for the National Register of Historic Places. It is your responsibility to determine further actions, such as field surveys, to identify historic properties.

This information is provided on request to assist in identifying historic properties, as specified in §36CFR800 for Section 106 consultation procedures. If you have questions, please contact me at (801) 533-3555. My email address is: jdykman@history.state.ut.us

As ever,

James L. Dykmann
Compliance Archaeologist

JLD:01-1596 OR

Environmental Consultants

FRONTIER CORPORATION USA

ENVIRONMENTAL BASELINE REPORT

PROMONTORY LANDFILL SITE
BOX ELDER COUNTY, UTAH

Prepared for:

PACIFIC WEST, LLC.
1515 South 2200 West, Suite # C
Salt Lake City, Utah 84119

Prepared by:

Frontier Corporation USA
221 N. Spring Creek Parkway, Suite B
Providence, Utah 84332

October 2003

Table of Contents

1.0 INTRODUCTION

Promontory Landfill LLC is proposing to construct and operate a private landfill site at Promontory Point in Box Elder County, Utah. The Project Area encompasses approximately 2,006 acres and is located approximately 23 miles west of Ogden on the southwestern side of the Point, immediately north of the existing Union Pacific railroad line (Figure 1). The Project Area covers parts of Sections18, 19, and 30 in T6N, R5W, and Sections 13, 14, 23, 24, and 25 in T6N, R6W (Figure 2). The Project Area is intended to be used as a regional landfill for municipalities in northern Utah. It will include a 1,000-acre Disposal Area for municipal waste and a 1,006-acre Buffer Area for wildlife habitat conservation.

Promontory Landfill LLC prepared an initial environmental report for the proposed landfill project. The initial report was reviewed by the U.S. Fish and Wildlife Service (USFWS) and the Utah Division of Wildlife Resources (UDWR). In response to potential issues identified by the USFWS and UDWR, Frontier Corporation USA was retained to conduct a baseline inventory of existing habitat types and wildlife conditions within the Project Area. The purpose of the baseline inventory was to identify and map habitat types, and to assess habitat values for various wildlife.

1.1 Site Description

The Project Area is located on the southern point of the Promontory Mountain Range. The Promontory mountains form a narrow peninsula that extends into the northcentral portion of the Great Salt Lake.

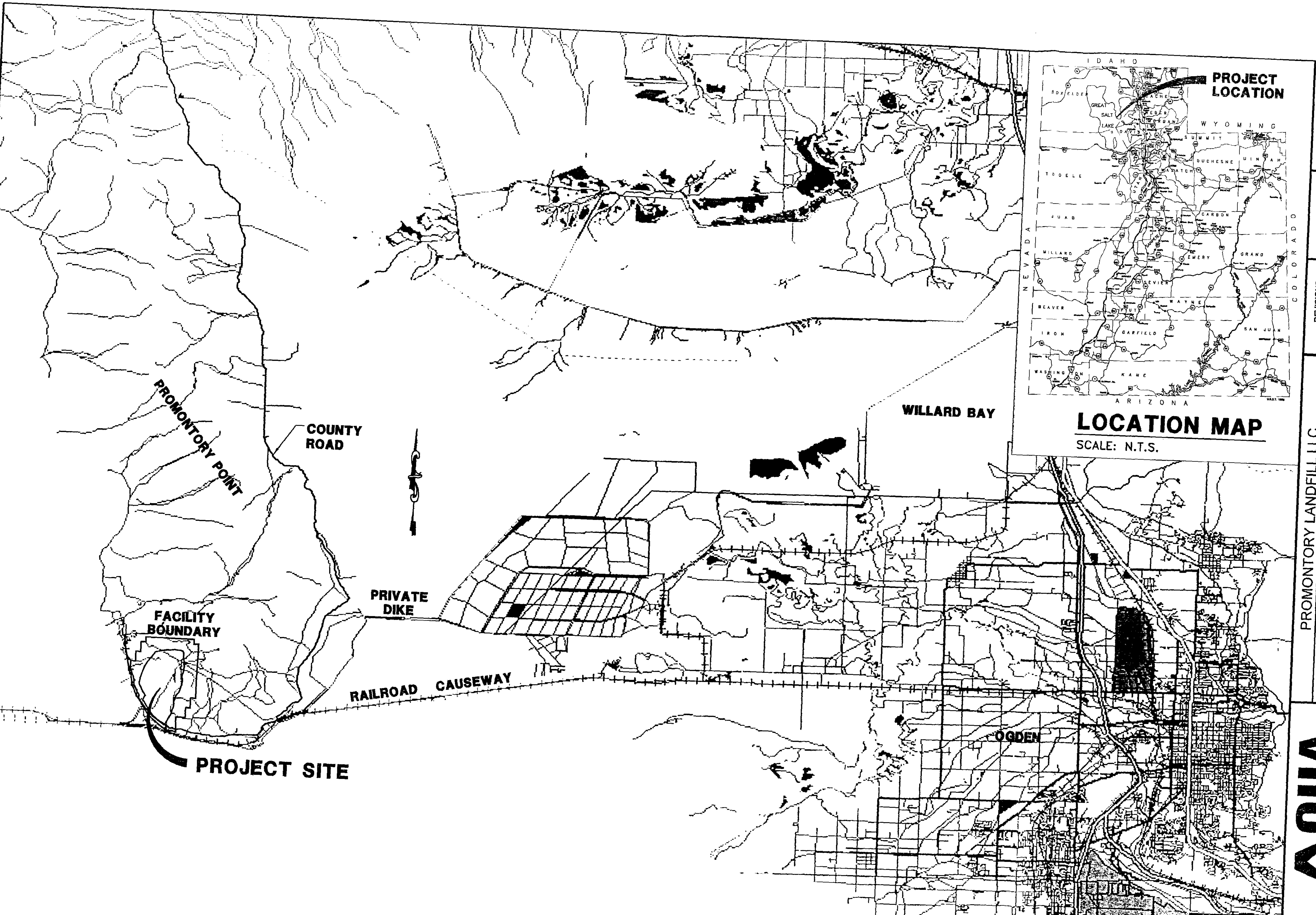
The entire Project Area is located on private property. Surrounding properties are also privately owned. The Project Area is bounded by steep, rocky terrain on the north, east, and west, and by the Union Pacific Railroad to the south. The elevation of the Project Area varies between 4,220 and 5,200 feet above sea level. The general slope of the Project Area is from north to south, and it has two primary drainages.

The Project Area is comprised of semiarid grassland and rock outcrops. Certain areas have been recently disced to create linear firebreaks. The disced areas have been cleared of grass and sagebrush at a width of approximately 15 feet. The disced areas appear to be situated along the eastern boundary of the Project Area and along a fence line in the northern portion of the Project Area. The disced areas have been seeded with wild sunflower (*Helianthus annuus*).

2.0 METHODS

The Project Area was visited on three separate occasions in August and September 2003. A wildlife biologist and a wetlands ecologist conducted:

- General habitat mapping;
- An assessment for the presence of wetlands and other water-related features;
- Raptor and migratory bird surveys; and



VICINITY MAP

SCALE: N.T.S.

DESIGN:	CAH
DRAWN:	TWE
CHECKED:	CAH
SCALE: HORZ.	AS SHOWN
SCALE: VERT.	NONE
DATE:	SEPT. 2003

ENGINEERS SEAL

REVISIONS

NO.	DATE

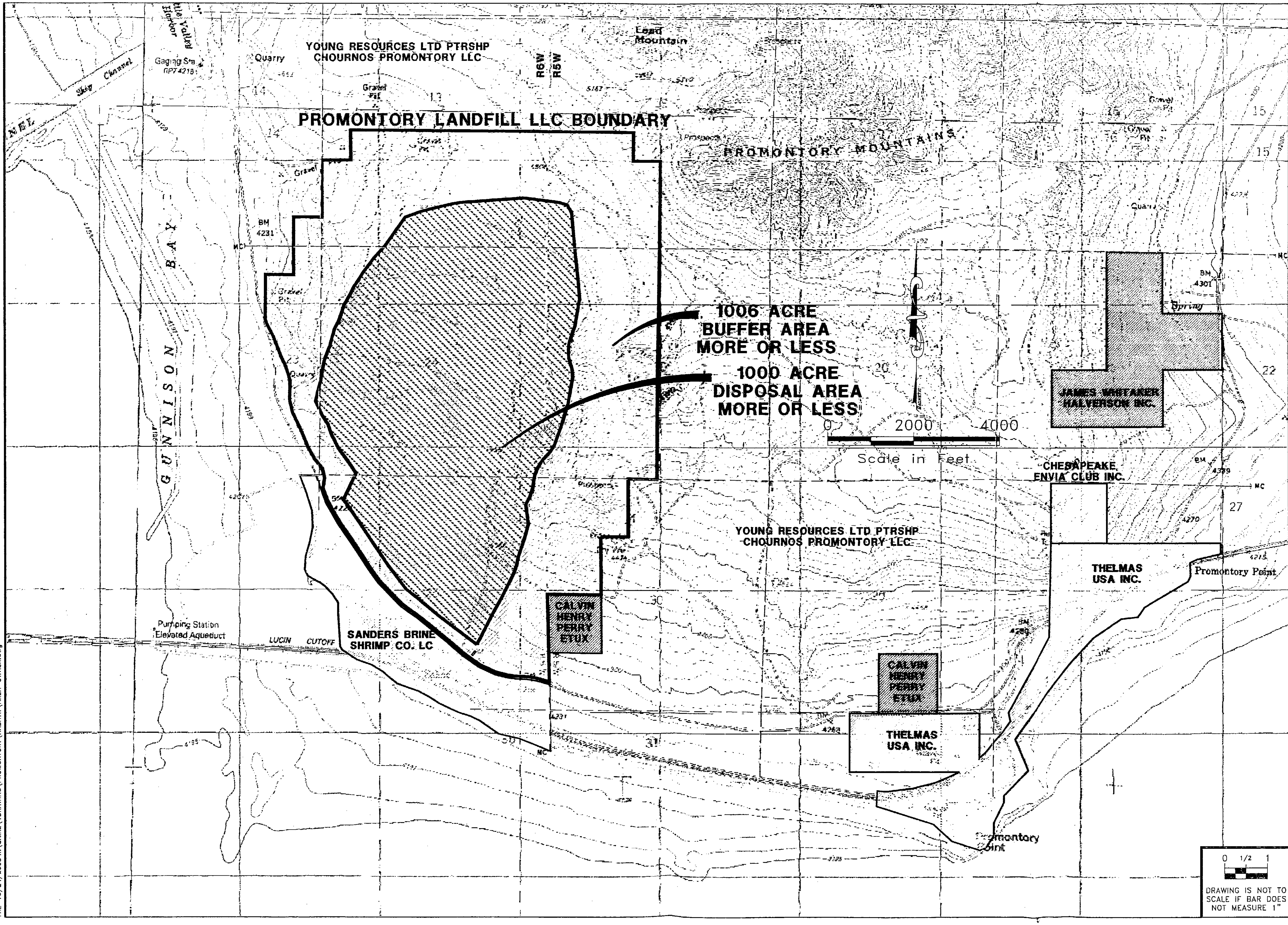
PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
BASELINE DATA COLLECTION
VICINITY MAP

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE: 1

10/24/2003 X:\SHIRE\1DRAWING\PROMONTORY\HABITAT\VICINITY.dwg



DESIGN: CAH
DRAWN: TWE
CHECKED: CAH
SCALE: HORIZ. 1" = 2000' VERT. NONE
DATE: SEPT. 2003

ENGINEERS SEAL

REVISIONS
NO. DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
BASELINE DATA COLLECTION
OWNERSHIP MAP

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

FIGURE: 2

TWE 10/24/2003 X:\SHIRE\1DRAWING\PROMONTORY\HABITAT\AREA-OWNER.dwg

- General wildlife observations.

The Project Area was inventoried by walking or driving transects where roads were available. In addition, the two major drainages were walked and cliff and rock outcrops were glassed with binoculars and spotting scopes for nests and wildlife activity. During the field inspections, the approximate locations of habitat boundaries were hand-drawn onto copies of aerial photography. Aqua Engineering digitized the habitat mapping and incorporated it into the Project's AUTOCAD database to estimate acreages and to produce maps.

3.0 HABITAT CLASSIFICATION

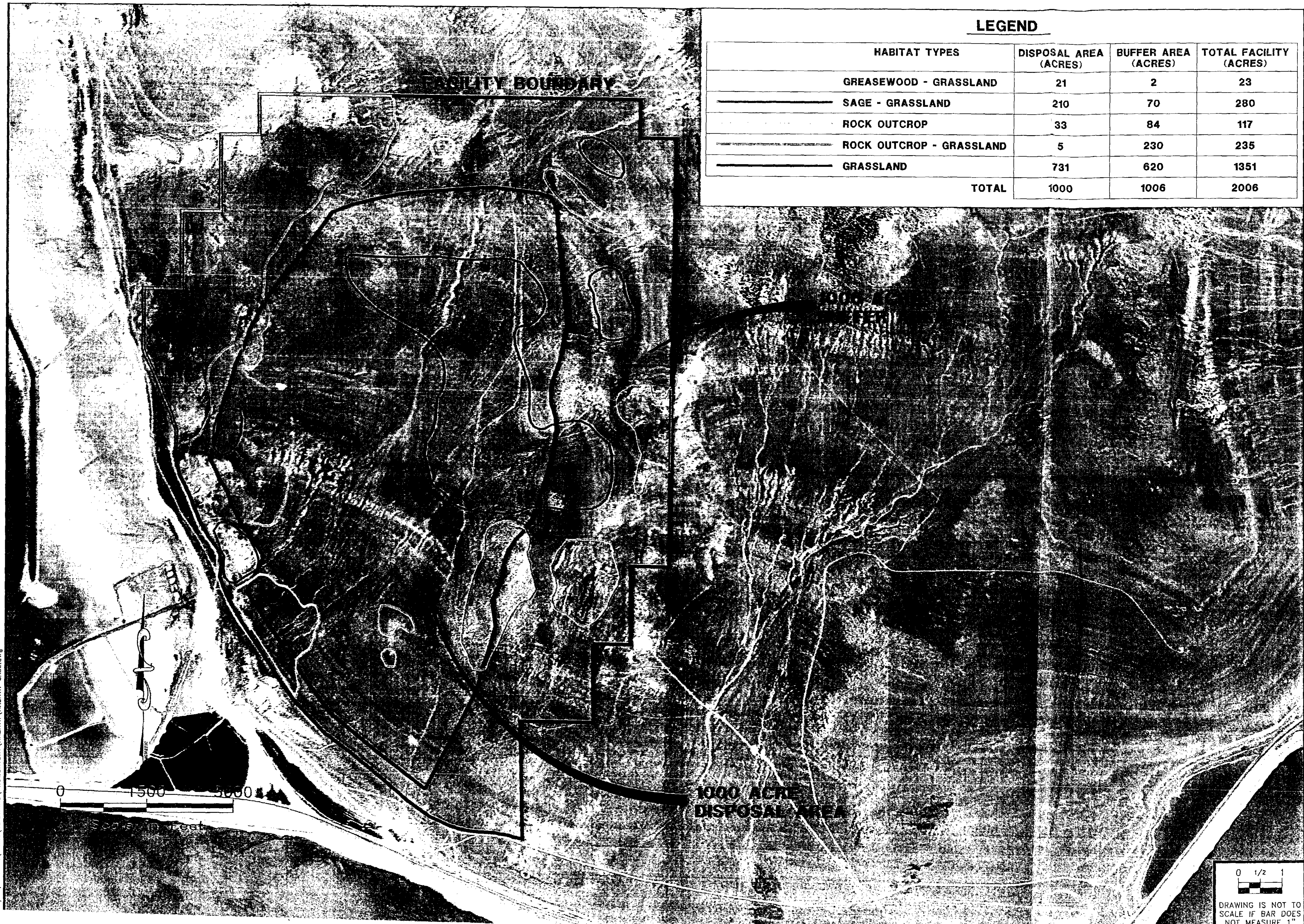
The Project Area is a very rocky site with mostly semiarid grassland dominated by Idaho fescue (*Festuca idahoensis*) and cheatgrass (*Bromus tectorum*). Areas with substantial rock outcrops, sagebrush (*Artemesia tridentata*), or greasewood (*Sarcobatus vermiculatus*) cover were delineated separately (Figure 3). An itemization of habitat acreages that were delineated within the Disposal Area and Buffer Area are shown in Table 1 below.

Table 1. Acreages of habitat types delineated at the Promontory Landfill Project Area.

Habitat Types	Disposal Area (Acres)	Buffer Area (Acres)	Total Facility (Acres)
Grassland	731	620	1,351
Sagebrush/Grassland	210	70	280
Greasewood/Grassland	21	2	23
Rock Outcrop/Grassland	5	230	235
Rock Outcrop	33	84	117
Total	**1,000**	**1,006**	**2,006**

Vegetative cover is very sparse throughout the Project Area. Factors limiting vegetative cover appear to include: the rocky geologic nature of the site; the semiarid environment; lack of perennial and/or intermittent water sources; and a long history of heavy grazing pressure by cattle and sheep.

The Project Area is an extremely dry site. No wetland habitats, stream channels or other jurisdictional waterways were identified within the boundaries of the Project Area. No riparian areas, livestock ponds or watering troughs were observed within the Project Area. However, there are two deeply incised drainages within the central portion of the Project Area. These drainages generally lack channels with defined beds, banks, and ordinary high-water marks. These drainages are also discontinuous in several locations and dissipate on the lower terraces within the Project Area without any direct surface connections to the Great Salt Lake.



LEGEND

HABITAT TYPES	DISPOSAL AREA (ACRES)	BUFFER AREA (ACRES)	TOTAL FACILITY (ACRES)
GREASEWOOD - GRASSLAND	21	2	23
SAGE - GRASSLAND	210	70	280
ROCK OUTCROP	33	84	117
ROCK OUTCROP - GRASSLAND	5	230	235
GRASSLAND	731	620	1351
TOTAL	1000	1006	2006

DESIGN: CAH
DRAWN: TWE
CHECKED: CAH
SCALE: HORZ. 1" = 1500' VERT. NONE
DATE: SEPT. 2003

ENGINEERS SEAL

REVISIONS	
NO.	DATE

PROMONTORY LANDFILL LLC

PROMONTORY LANDFILL FACILITY
BASELINE DATA COLLECTION
HABITAT DELINEATION

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

FIGURE: 3

10/24/2003 X:\SHIRE\1DRAWING\PROMONTORY\HABITAT\HABITAT BASE.dwg

4.0 WILDLIFE CONDITIONS

During the August-September baseline collection period, all wildlife species observed were recorded. Any evidence or signs of recent wildlife use were also recorded. A list of wildlife species observed during the surveys is contained in Appendix A.
Both direct and indirect observations of wildlife use were recorded throughout the Project Area. Wildlife observations included: big game, raptors and other migratory birds, furbearers and small mammals, and reptiles. A general description of the wildlife observations are provided below.

4.1 Big Game

According to UDWR, the Project Area is considered spring, summer, and autumn habitat for mule deer. The Project Area is within the Promontory Point Cooperative Wildlife Management Unit Boundary. Very little mule deer sign was observed within the Project Area. One grouping of pellets was found on the western portion of the Project Area. Five individual deer were observed in the eastern boundary of the buffer area. No deer observations or other sign were observed elsewhere in the Project Area.

4.2 Game Birds

No game birds were observed in or near the Project Area.

4.3 Raptors and Migratory Birds

The Project Area is used by several species of raptors. All raptor observations made during the field surveys were recorded. Cliffs located on the eastern portion of the Buffer Area provide excellent nesting opportunities for raptors. A limited amount of juniper trees also provide nesting opportunities. The cliffs and trees were glassed with a spotting scope and binoculars. Raptors observed in the Project Area during the surveys included: American kestrel , red-tailed hawks, and turkey vultures. No nests were observed. However, the absence of raptor nesting sites cannot be completely discounted at this time because the baseline study was conducted outside of the nesting season. In addition, two burrowing owls were observed utilizing badger digs along the terrace slopes of the main drainages. Because the digs did not exhibit long-term use by the owls, it is assumed that these two individuals were probably migrants.

4.4 Furbearers and Small Mammals

Coyote sign was not observed in the Project Area, probably as a result of eradication measures for livestock grazing. Badger digs were noted along the two main drainages in the Project Area. Numerous observations of jackrabbits were observed in the sagebrush/grassland community. Numerous small mammal digs were found throughout the gentle sloping areas and drainages in the Project Area.

4.5 Reptiles and Amphibians

Few reptiles (small lizards and one horned lizard) were observed. No permanent water sources were observed on or near the Project Area. No amphibians were observed during the surveys and there appears to be no available habitat present capable of supporting amphibians within the Project Area.

5.0 THREATENED, ENDANGERED AND CANDIDATE SPECIES

The USFWS and Utah Division of Wildlife Resources websites provide the federal lists of threatened, endangered and/or candidate species. Listed species that may be present within Box Elder County, Utah include:

June sucker (*Chasmistes liorus*) - Endangered
Lahontan cutthroat trout (*Oncohynchus clarki henshawi*) - Threatened
Bald eagle (*Haliaeetus leucocephalus*) - Threatened
Fat-whorled pondsnail (*Stagnicola bonnevillensis*) - Candidate
Yellow-billed cuckoo (*Coccyzus americanus*) - Candidate,

There are no perennial streams, ponds, wetland complexes or other permanent water bodies within the Project Area. Therefore, there is no habitat within the Project Area for the fat-whorled pondsnail, June sucker or Lahontan cutthroat trout. In addition, there are no drainages with large riparian trees (cottonwoods, willows, boxelder) that would provide the habitat requirements for yellow-billed cuckoo.

Bald eagles frequent open bodies of water to forage on fish and waterfowl, although they will also forage on carrion. Bald eagle nests are usually built in large trees. Although it is possible that a migratory eagle may occasionally visit the Project Area, the absence of fish-bearing waterbodies, waterfowl habitat and large trees within or near the Project Area probably preclude the regular usage of the area by bald eagle.

APPENDIX A

WILDLIFE SPECIES OBSERVED DURING AUGUST & SEPTEMBER 2003 SURVEYS

PROMONTORY POINT LANDFILL PROJECT AREA BOX ELDER COUNTY, UTAH

BIRDS

Species	Habitat, Comments
Turkey vulture (*Cathartes aura*)	Several birds observed over Project Area
Red-tailed hawk (*Buteo jamaicensis*)	Three individuals observed flying in the eastern portion.
Mourning dove (*Zenaida macrovra*)	Two bird flushed from drainage, central Project Area
Common raven (*Covus corax*)	Several individuals observed flying over area
Shrike species (*Lanius* spp.)	Several individuals observed in sagebrush
Sage sparrow (*Amphispiza belli*)	Several observed in sagebrush
American kestral (*Falco sparverius*)	One individual observed in western portion
Burrowing owl (*Athene cunicularia*)	Two individuals observed in drainages
Cliff swallow (*Hirundo pyrrhonota*)	Several individuals observed in southern portion
Western meadow lark (*Sturnella neglecta*)	Several individuals observed in area

MAMMALS

Species	Habitat, Comments
Mule Deer (*Odocoileus hemionus*)	One pellet groups in northwestern portion, 5 individuals observed in eastern portion of the buffer zone
Badger (*Taxidea taxus*)	Numerous digs on drainage side slopes
Kangaroo rat (*Dipodomys* spp.)	Numerous burrows throughout Project Area

REPTILES

Species	Habitat, Comments
Side blotched lizard (*Uta stansburiana*)	Several individuals observed in sage areas
Desert horned lizard (*Phrynosoma platyrhinos*)	One individual observed in southwest portion

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

November 17, 2003

Regulatory Branch (200350588)

Mark Easton
Pacific West, LLC
1515 West 2200 South, Suite C
Salt Lake City, Utah 84119

Dear Mr. Easton:

This concerns your proposed Promontory Landfill site located at Promontory Point in Sections 18, 19, and 30, Township 6 North, Range 5 West, and Sections 13, 14, 23, 24, and 25, Township 6 North, Range 6 West, SLB&M, Box Elder County, Utah.

Based on the Environmental Baseline Report you have provided and a site visit made on October 22, 2003, we have determined that there are no waters of the United States, including wetlands, within the approximately 1000-acre disposal area shown on the attached map. Therefore, a Department of the Army Permit is not required for work in this area.

We have issued identification number 200350588 to this action. Please refer to this number in any further correspondence concerning this project. If you have any questions, please contact Mr. James Thomas at the Utah Regulatory Office, 533 West 2600 South, Suite 150, Bountiful, Utah 84010, or email Jim.Thomas@usace.army.mil, or telephone 801-295-8380, extension 18.

Sincerely,

B Carter for

Nancy Kang
Chief, Utah Regulatory Office

Enclosures

Copy furnished w/o enclosures:

Dennis Wenger, Frontier Corporation, 221 North Spring Creek Drive, Suite B, Providence, Utah 84332
Chet Hovey/Darin Hawkes, Aqua Engineers, Inc., 533 West 2600, Suite 275, Bountiful, Utah 84010

APPENDIX G
LINER AND COMPONENT SPECIFICATIONS

AQUA ENGINEERING, INC.

GEOSYNTHETIC CLAY LINER

CETCO
LINING TECHNOLOGIES
800.527.9948 www.cetco.com

1500 W. Shure Dr. Arlington Heights, Illinois 60004 USA
Phone: +1-847-392-5800 • Fax: +1-847-506-6150
www.cetco.com

MEMO

To: Chet Hovey

From: Bill Urchik

Fax: 847-506-6150
Ph: 800-527-9948

Company: CETCO

No. Pages: 1– including cover

Date: June 6, 2003

Dear Chet,

Please accept this memo in regard to our recent telephone conversation regarding a new landfill in Utah where the waste is expected to be placed approximately 1,000 feet in height on the liner system. Apparently the state of Utah has concerns with the bentonite layer thinning as a result of this much load being placed on a GCL.

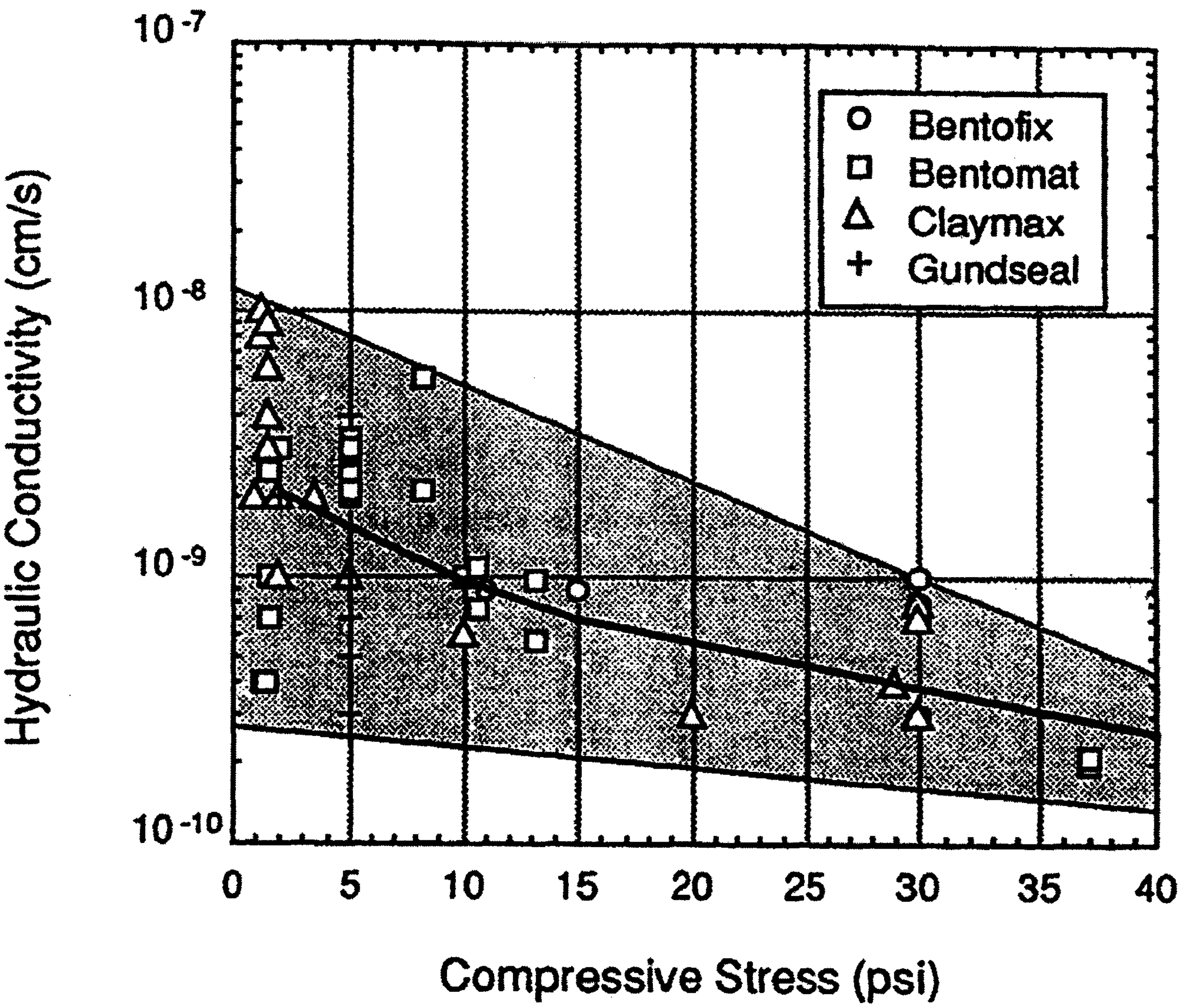
When a load of this magnitude is placed upon the GCL the bentonite layer will become compressed. However, it is not expected to become compressed as a result of becoming displaced as the presence of a void space near the GCL is required for the bentonite to become displaced and creating this type of thinning. Furthermore, the high density of needlepunching in CETCO GCL further prohibits bentonite migration. What will happen when the GCL is subjected to a load of this magnitude is the void space between the bentonite platelets will become compressed decreasing its effective hydraulic conductivity. Independent research has confirmed this phenomenon in GCLs when subjected to high normal load conditions. In summary, the hydraulic performance of the GCL will be greatly enhanced as a result of these loading conditions. Reviewing the attached figure from research conducted by Dr. Dave Daniels and further research conducted by Kerry Rowe at The University of Western Ontario, indicate the hydraulic conductivity of a GCL under the loading conditions expected at this facility to be in the order of $1x10^{-20}$ cm/sec. This assumes the slope of the design line to remain linear beyond the testing conducted at compressive stresses greater than 40 psi. Reviewing the line it appears the hydraulic conductivity of a GCL will decrease by one order of magnitude every 55psi of normal stress added to the GCL.

Should you require further information, please do not hesitate to contact me at 1-800-527-9948 x 7939.

Best Regards,

WmUrchik

William Urchik
Project Engineer
CETCO
bill.urchik@cetco.com



Hydraulic Conductivity (cm/s)
10^{-7}
10^{-8}
10^{-9}
10^{-10}
0
5
10
15
20
25
30
35
40
Compressive Stress (psi)
Bentofix
Bentomat
Claymax
Gundseal

BENTOMAT® ST

GEOSYNTHETIC CLAY LINER SPECIFICATION GUIDELINES

This specification is intended for use as a GENERAL GUIDELINE for developing a specification for a specific project. It is NOT intended as a substitute for a detailed specification, which must be written to address site-specific conditions. Shaded areas of this guideline indicate items that are typically considered specific to certain applications

1.0 GENERAL

1.1 Scope

This specification covers the technical requirements for the furnishing and installation of the geosynthetic clay liner described herein. All materials used shall meet the requirements of this specification, and all work shall be performed in accordance with the procedures provided herein and the contract drawings.

1.2 Definitions

For the purposes of this specification guideline, the following terms are defined below:

Geosynthetic Clay Liner (GCL). A manufactured hydraulic barrier consisting of clay bonded to a layer or layers of geosynthetics.

Geomembrane. An essentially impermeable geosynthetic composed of one or more geosynthetic sheets.

Geotextile. Any permeable geosynthetic comprised solely of textiles.

Minimum Average Roll Value. For geosynthetics, the value calculated as the typical value minus two (2) standard deviations from documented quality control test results for a defined population from one specific test method associated with one specific property.

Overlap. Where two adjacent GCL panels contact, the distance measuring perpendicular from the overlying edge of one panel to the underlying edge of the other.

Typical Value. The mean value calculated from documented manufacturing quality control test results for a defined population obtained from one test method associated with one specific property.

1.3 Unit Prices

Measurement will be made of the total surface area in square feet covered by the GCL as shown on the contract drawings. Final quantities will be based on as-built conditions. Allowance will be made for GCL in anchor and drainage trenches but no allowance will be made for waste, overlap, or materials used for the convenience of the Contractor. GCL installed and accepted will be paid for at the respective contract unit price in the bidding schedule.

1.4 Submittals

A. With the bid, the Contractor shall furnish the following information:

1. Conceptual description of the proposed plan for placement of the GCL panels over the area of installation.
2. GCL manufacturer's MQC Plan for documenting compliance to Sections 2.1 and 2.2 of these specifications.
3. GCL manufacturer's historical data for reinforced GCL from 10,000-hour creep shear testing per Section 2.1 D.

B. At the Engineer's or Owner's request the Contractor shall furnish:

1. A representative sample of the GCLs.
2. A project reference list for the GCL(s) consisting of the principal details of at least ten projects totaling at least 10 million square feet (100,000 square meters) in size.

C. Upon shipment, the Contractor shall furnish the GCL manufacturer's Quality Assurance/Quality Control (QA/QC) certifications to verify that the materials supplied for the project are in accordance with the requirements of this specification.

D. As installation proceeds, the Contractor shall submit certificates of subgrade acceptance, signed by the Contractor and CQA Inspector (see Section 1.7) for each area that is covered by the GCL.

1.5 Qualifications

A. GCL Manufacturer must have produced at least 10 million square feet (1 million square meters) of GCL, with at least 8 million square feet (800,000 square meters) installed.

B. The GCL Installer must either have installed at least 1 million square feet (100,000 square meters) of GCL, or must provide to the Engineer satisfactory evidence, through similar experience in the installation of other types of geosynthetics, that the GCL will be installed in a competent, professional manner.

1.6 Construction Quality Assurance (CQA)

A. The Owner and Engineer shall provide a third-party inspector for CQA of the GCL installation. The inspector shall be an individual or company who is independent from the manufacturer and installer, who shall be responsible for monitoring and documenting activities, related to the CQA of the GCL, throughout installation. The inspector shall have provided CQA services for the installation of the proposed or similar GCL for at least 5 completed projects totaling not less than 1 million square feet (100,000 square meters).

B. Testing of the GCL, as necessary to support the CQA effort, shall be performed by a third party laboratory retained by the Contractor and independent from the GCL manufacturer and installer. The laboratory shall have provided GCL CQA testing of the proposed or similar GCL for at least 5 completed projects totaling not less than 1 million square feet (100,000 square meters).

C. CQA shall be provided in accordance with the *GCL CQA Manual* provided by the engineer.

2.0 PRODUCTS

A. The GCLs shall consist of a layer of natural sodium bentonite clay encapsulated between two geotextiles and shall comply with all of the criteria listed in this Section. Prior to using an alternate GCL, the Contractor must furnish independent test results demonstrating that the proposed alternate material meets all requirements of this specification. The Contractor also must obtain prior approval of the alternative GCL by the Project Engineer.

B. Reinforced GCL must be used on slopes as designated by the Engineer. Unreinforced GCL may be used on slopes not exceeding 10H:1V.

2.1 Materials

A. Acceptable reinforced GCL products are Bentomat® ST or an engineer-approved equal.

B. Areas requiring reinforced GCL will be furnished with Bentomat® ST. The delineation of these areas shall be agreed by the Installer and the Engineer prior to installation.

C. The reinforced GCL and its components shall have the properties shown in Table TR404-st.

D. The reinforced GCL shall have 10,000 hour test data for large-scale constant-load (creep) shear testing under hydrated conditions. The constant shear load shall be 0.56 kN and the normal load shall be 1.1 kN.

E. The minimum acceptable dimensions of full-size GCL panels shall be 150 feet (45.7 m) in length. Short rolls [(those manufactured to a length greater than 70 feet (21 m) but less than a full-length roll)] may be supplied at a rate no greater than 3 per truckload or 3 rolls every 36,000 square feet (3,500 square meters) of GCL, whichever is less.

F. A 6-inch (150 mm) overlap guideline shall be imprinted on both edges of the upper geotextile component of the GCL as a means for providing quality assurance of the overlap dimension. Lines shall be printed in easily visible, non-toxic ink.

2.2 Product Quality Documentation

The GCL manufacturer shall provide the Contractor or other designated party with manufacturing QA/QC certifications for each shipment of GCL. The certifications shall be signed by a responsible party employed by the GCL manufacturer and shall include:

A. Certificates of analysis for the bentonite clay used in GCL production demonstrating compliance with the parameters swell index and fluid loss shown in tables TR404-st and TR404-200r.

B. Manufacturer's test data for finished GCL product(s) of bentonite mass/area, GCL tensile strength and GCL peel strength (reinforced only) demonstrating compliance with the index parameters shown in tablesTR404-st and/or TR404-200r.

C. GCL lot and roll numbers supplied for the project (with corresponding shipping information).

Manufacturer's test data for finished GCL product(s) including GCL index flux, permeability and hydrated internal shear strength data demonstrating compliance with the performance parameters shown in tables TR404-st and TR404-200r is available upon request of the manufacturer.

Table TR-404ST
Bentomat ST / Reinforced GCL

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY, ft2 (m2)	REQUIRED VALUES
Bentonite Swell Index[1]	ASTM D 5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss[1]	ASTM D 5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area[2]	ASTM D 5993	40,000 ft^2 (4,000 m^2)	0.75 lb/ft^2 (3.6 kg/m^2)
GCL Grab Strength[3]	ASTM D 4632	200,000 ft^2 (20,000 m^2)	90 lbs (400 N)
GCL Peel Strength[3]	ASTM D 4632	40,000 ft^2 (4,000 m^2)	15 lbs (65 N)
GCL Index Flux[4]	ASTM D 5887	Weekly	1×10^{-8} $m^3/m^2/sec$
GCL Permeability[4]	ASTM D 5887	Weekly	5×10^{-9} cm/sec
GCL Hydrated Internal Shear Strength[5]	ASTM D 5321	Periodic	500 psf (24 kPa) typical

Bentomat "ST" is a reinforced GCL consisting of a layer of sodium bentonite between a woven and a non-woven geotextile, which are needlepunched together.

Notes

1 Bentonite property tests performed at CETCO's bentonite processing facility before shipment to CETCO's GCL production facilities.
2 Bentonite mass/area reported at 0 percent moisture content.
3 All tensile testing is performed in the machine direction, with results as minimum average roll values unless otherwise indicated.
4 Index flux and permeability testing with deaired distilled/deionized water at 80-psi (551 kPa) cell pressure, 77 psi (531 kPa) headwater pressure and 75 psi (517 kPa) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. This flux value is equivalent to a permeability of 5×10^{-9} cm/sec for typical GCL thickness. This flux value should not be used for equivalency calculations unless the gradients used represent field conditions. A flux test using gradients that represent field conditions must be performed to determine equivalency. The last 20 weekly values prior the end of the production date of the supplied GCL may be provided.
5 Peak value measured at 200-psf (30 kPa) normal stress. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

2.3 Product Labeling

A. Prior to shipment, the GCL manufacturer shall label each roll, identifying:

1. Product identification information (Manufacturer's name and address, brand product code).

2. Lot number and roll number.

3. Roll length, width and weight.

2.4 Packaging

A. The GCL shall be wound around a rigid core whose diameter is sufficient to facilitate handling. The core is not necessarily intended to support the roll for lifting but should be sufficiently strong to prevent collapse during transit.

B. All rolls shall be labeled and bagged in packaging that is resistant to photodegradation by ultraviolet (UV) light.

2.5 Accessory Bentonite

A. The granular bentonite sealing clay used for overlap seaming, penetration sealing and repairs shall be made from the same natural sodium bentonite as used in the GCL and shall be as recommended by the GCL manufacturer. Seaming of GCLs shall be conducted in accordance with the manufacturer's guidelines for each particular GCL. Please refer to the installation guidelines for Bentomat/Claymax GCLs.

3.0 EXECUTION

3.1 Shipping and Handling

A. The manufacturer assumes responsibility for initial loading the GCL. Shipping will be the responsibility of the party paying the freight. Unloading, on-site handling and storage of the GCL are the responsibility of the Contractor, Installer or other designated party.

B. A visual inspection of each roll should be made during unloading to identify if any packaging has been damaged. Rolls with damaged packaging should be marked and set aside for further inspection. The packaging should be repaired prior to being placed in storage.

C. The party responsible for unloading the GCL should contact the Manufacturer prior to shipment to ascertain the appropriateness of the proposed unloading methods and equipment.

3.2 Storage

A. Storage of the GCL rolls shall be the responsibility of the installer. A dedicated storage area shall be selected at the job site that is away from high traffic areas and is level, dry and well drained.

B. Rolls should be stored in a manner that prevents sliding or rolling from the stacks and may be accomplished by the use of chock blocks. Rolls should be stacked at a height no higher than that at which the lifting apparatus can be safely handled (typically no higher than four).

C. All stored GCL materials and the accessory bentonite must be covered with a plastic sheet or tarpaulin until their installation.

D. The integrity and legibility of the labels shall be preserved during storage.

3.3 Earthwork

A. Any earthen surface upon which the GCL is installed shall be prepared and compacted in accordance with the project specifications and drawings. The surface shall be smooth, firm, and unyielding, and free of:

1. Vegetation.
2. Construction Debris.
3. Sticks.
4. Sharp rocks.
5. Void spaces.
6. Ice.
7. Abrupt elevation changes.
8. Standing water.
9. Cracks larger than one-quarter inch (6 mm) in width.
10. Any other foreign matter that could contact the GCL.

B. Subgrade surfaces consisting of granular soils or gravel may not be acceptable due to their large void fraction and puncture potential. *In high head applications, such as ponds and wastewater lagoons, subgrade soils should possess a particle size distribution such that at least 80 percent of the soil is finer than a #60 sieve (0.250 mm).*

C. Immediately prior to GCL deployment, the subgrade shall be final-graded to fill in all voids or cracks and then smooth-rolled to provide the best practicable surface for the GCL. At completion of this activity, no wheel ruts, footprints or other irregularities shall exist in the subgrade. Furthermore, all protrusions extending more than one-half inch (12 mm) from the surface shall either be removed, crushed or pushed into the surface with a smooth-drum compactor.

D. On a continuing basis, the project CQA inspector shall certify acceptance of the subgrade before GCL placement.

E. It shall be the installer's responsibility thereafter to indicate to the Engineer any change in the condition of the subgrade that could cause the subgrade to be out of compliance with any of the requirements listed in this Section.

F. At the top of sloped areas of the job site, an anchor trench for the GCL shall be excavated or an equivalent runout shall be utilized in accordance with the project plans and specifications and as approved by the CQA Inspector. When utilizing an anchor trench design, the trench shall be excavated and approved by the CQA Inspector prior to GCL placement. No loose soil shall be allowed at the bottom of the trench and no sharp corners or protrusions shall exist anywhere within the trench.

3.4 GCL Placement

A. Unreinforced GCL shall be placed on the flatter areas of the site; reinforced GCL shall be placed on the more steeply sloped areas. The Installer and Project engineer shall review and agree upon which GCL shall be placed on these areas prior to installation.

B. GCL rolls should be delivered to the working area of the site in their original packaging. Immediately prior to deployment, the packaging should be carefully removed without damaging the GCL. The orientation of the GCL (i.e., which side faces up) should be in accordance with the Engineer's recommendations.

C. Equipment, which could damage the GCL, shall not be allowed to travel directly on it. If the installation equipment causes rutting of the subgrade, the subgrade must be restored to its originally accepted condition before placement continues.

D. Care must be taken to minimize the extent to which the GCL is dragged across the subgrade in order to avoid damage to the bottom surface of the GCL. A temporary geosynthetic subgrade covering commonly known as a slip sheet or rub sheet may be used to reduce friction damage during placement.

E. The GCL panels shall be placed parallel to the direction of the slope.

F. All GCL panels should lie flat on the underlying surface, with no wrinkles or fold, especially at the exposed edges of the panels.

G. Only as much GCL shall be deployed as can be covered at the end of the working day with soil, a geomembrane, or a temporary waterproof tarpaulin. The GCL shall not be left uncovered overnight. If the GCL is hydrated when no confining stress is present, it may be necessary to remove and replace the hydrated material. The project Engineer, CQA inspector, and GCL supplier should be consulted for specific guidance if premature hydration occurs.

3.5 Anchorage

A. As directed by the project drawings and specifications, the end of the GCL roll shall be placed in an anchor trench at the top of the slope or an equivalent runout design shall be utilized. When utilizing an anchor trench design, the front edge of the trench should be rounded so as to eliminate any sharp corners. Loose soil should be removed from the floor of the trench. The GCL should cover the entire trench floor but does not extend up the rear trench wall.

3.6 Seaming

A. The GCL seams are constructed by overlapping their adjacent edges. Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris. Supplemental bentonite is required for reinforced GCL.

B. The minimum dimension of the longitudinal overlap should be 6 inches (150 mm). End-of-roll overlapped seams should be similarly constructed, but the minimum overlap should measure 24 inches (600 mm).

C. Seams at the ends of the panels should be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone.

D. Bentonite-enhanced seams are constructed between the overlapping adjacent panels described above. The underlying edge of the longitudinal overlap is exposed and then a continuous bead of granular sodium bentonite is applied along a zone defined by the edge of the underlying panel and the 6-inch (150-mm) line. A similar bead of granular sodium bentonite is applied at the end-of-roll overlap. The granular bentonite shall be applied at a minimum application rate of one quarter pound per lineal foot (0.4 kg/m). Please refer to the Bentomat/Claymax installation guidelines for the seaming requirements of a particular GCL.

3.7 Detail Work

A. The GCL shall be sealed around penetrations and embedded structures embedded in accordance with the design drawings and the GCL Manufacturer.

B. Cutting the GCL should be performed using a sharp utility knife. Frequent blade changes are recommended to avoid damage to the geotextile components of the GCL during the cutting process.

3.8 Damage Repair

A. If the GCL is damaged (torn, punctured, perforated, etc.) during installation, it may be possible to repair it by cutting a patch to fit over the damaged area. The patch shall be obtained from a new GCL roll and shall be cut to size such that a minimum overlap of 12 inches (300 mm) is achieved around all of the damaged area. Granular bentonite or bentonite mastic should be applied around the damaged area prior to placement of the patch. It may be desirable to use an adhesive to affix the patch in place so that it is not displaced during cover placement.

3.9 Cover Placement

A. Cover soils shall be free of angular stones or other foreign matter that could damage the GCL. Cover soils should be approved the project Engineer with respect to particle size, uniformity and chemical compatibility. Cover soils with high concentrations of calcium (e.g., limestone, dolomite) are not acceptable.

B. Soil cover shall be placed over the GCL using construction equipment that minimizes stresses on the GCL. A minimum thickness of 1 foot (300 mm) of cover should be maintained between the equipment tires/tracks and the GCL at all times during the covering process. This thickness recommendation does not apply to frequently trafficked areas or roadways, for which a minimum thickness of 2 feet (600 mm) is required.

C. Soil cover should be placed in a manner that prevents the soil from entering the GCL overlap zones. Cover soil shall be pushed up slopes, not down slopes, to minimize tensile forces on the GCL.

D. Although direct vehicular contact with the GCL is to be avoided, lightweight, low ground pressure vehicles (such as 4-wheel all-terrain vehicles) may be used to facilitate the installation of any geosynthetic material placed over the GCL. The GCL supplier or CQA engineer should be contacted with specific recommendations on the appropriate procedures in this situation.

E. When a textured geomembrane is installed over the GCL, a temporary geosynthetic covering known as a slip sheet or rub sheet should be used to minimize friction during placement and to allow the textured geomembrane to be more easily moved into its final position.

HIGH DENSITY POLYETHYLENE GEOMEMBRANE

1.0 SUMMARY - This section includes specifications and guidelines for manufacturing and installing geomembrane.

2.0 REFERENCES

Note: Test equipment and procedures are used which enable effective and economical confirmation that the product will conform to specifications based on the noted procedures. Some test procedures have been modified for application to geosynthetics. All procedures and values are subject to change without prior notification.

2.1 American Society for Testing and Materials (ASTM)

2.1.1 D 638 Standard Test Method for Tensile Properties of Plastics
2.1.2 D 792 Standard Test Method for Specific Gravity and Density of Plastics by Displacement
2.1.3 D 1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
2.1.4 D 1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
2.1.5 D 1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
2.1.6 D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
2.1.7 D 1593 Specification for Nonrigid Vinyl Chloride Plastic Sheeting
2.1.8 D 1603 Test Method for Carbon Black in Olefin Plastics
2.1.9 D 1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics
2.1.10 D 3015 Standard Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds
2.1.11 D 4437 Practice for Determining Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes

2.2 Federal Test Method Standards - 101 Puncture Resistance

2.3 NSF International - Standard 54 Flexible Membrane Liners

3.0 DEFINITIONS

3.1 Lot : A quantity of resin (usually the capacity of one rail car) used in the manufacture of polyethylene geomembrane rolls. The finished roll will be identified by a roll number traceable to the resin lot used.

3.2 Construction Quality Assurance Consultant: Party, independent from Manufacturer and Installer, that is responsible for observing and documenting activities related to quality assurance during the lining system construction.

3.3 Engineer: The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications.

3.4 Geomembrane Manufacturer: The party responsible for manufacturing the geomembrane rolls.

3.5 Geosynthetic Quality Assurance Laboratory (Testing Laboratory): Party, independent from the Owner, Manufacturer, and Installer, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing usually under the direction of the Owner.

3.6 Installer: The party responsible for field handling, transporting, storing, deploying, seaming, seam testing.

3.7 Panel: The unit area of geomembrane that will be seamed in the field. A panel is identified as a roll or portion of a roll that is larger than 100 square feet.

3.8 Subgrade Surface: The soil layer surface which immediately underlies the geosynthetic material(s).

4.0 SUBMITTALS POST-AWARD

4.1 Conform to pertinent provisions of Specification Section __________, Submittals.

4.2 Furnish the following product data, in writing, to the Engineer prior to installation of the geomembrane material.

4.2.1 Certify that geomembrane manufacturer is listed by NSF International.

4.2.2 Resin Data shall include the following.

- Certification stating that the resin meets the specification requirements (see Section 9.2)
- Certification stating all resin is from the same Manufacturer (see Section 9.2)
- Copy of Quality Assurance/Quality Control certificates issued by Geomembrane Manufacturer and resin supplier shall be submitted

4.2.3 Geomembrane Roll

- Certification stating that the resin meets the specification requirements (see Section 9.2)
- Statement certifying no reclaimed polymer is added to resin (product run may be recycled - see Section 9.2)
- Copy of quality assurance certificates issued by Geomembrane Manufacturer shall be furnished (See Section 9.2)

4.2.4 Extrudate resins and/or rod shall be certified that all extrudate is from one Manufacturer, is the same resin type, and was obtained from the same resin supplier as the resin used to manufacture the geomembrane rolls.

4.3 Furnish the following information to the Engineer and Owner prior to installation

4.3.1 Installation layout drawings-Submit drawings showing proposed panel layout including field seams and details. These drawings shall be approved prior to installing the geomembrane. This approval will be for concept only and actual panel placement will be determined by site conditions.

4.3.2 Installer's geosynthetic Field Installation Quality Assurance Plan

4.4 Submittals on a daily basis during installation

4.4.1 Subgrade Acceptance Forms

4.4.2 All QC Documentation and Field Testing Results (Destructive & Non-Destructive Test Results)

4.5 Submit the following to the Engineer upon completion of installation

4.5.1 Certificate stating the geomembrane has been installed in accordance with the Contract Documents

4.5.2 Material and installation warranties

4.5.3 As-built drawings showing actual Geomembrane panel placement and seams including typical anchor trench

5.0 QUALITY ASSURANCE

5.1 The Owner will engage and pay for the services of a Geosynthetic Quality Assurance Consultant and Laboratory to monitor geomembrane installation.

6.0 QUALIFICATIONS

6.1 Geomembrane Manufacturer

6.1.1 Geomembrane shall be manufactured by one of the following manufacturer's (or approved equal).

· GSE Lining Technology, Inc.

6.1.2 The manufacturer shall have manufactured a minimum of 10,000,000 square feet of HDPE geomembrane during the last year.

6.2. Installer

6.2.1 Installation shall be performed by one of the following installation companies (or approved equal).

· GSE Lining Technology, Inc.
· GSE Approved Dealer/Installers

6.2.2 The Installer shall have installed a minimum of [ ] square feet of HDPE geomembrane during the last [ ] years.

6.2.3 The Installer shall have worked in a similar capacity on at least [ ] projects similar in complexity to the project described in the contract documents, and with at least [ ] square feet of HDPE geomembrane installation on each project.

6.2.4 The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.

6.2.5 The Master Welder shall have completed a minimum of 1,000,000 square feet of geomembrane seaming work using the type of seaming apparatus proposed for use on this Project.

7.0 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

7.1. Labeling - Each roll of geomembrane delivered to the site shall be labeled by the manufacturer. The label shall clearly state the manufacturer's name, product identification, thickness, length, width and roll number. The label shall be found on either of the endcaps, an inside edge of the core, and outside the core.

7.2. Delivery - The rolls of liner shall be packaged and shipped by appropriate means to prevent damage to the material and to facilitate off-loading.

7.3 Storage - The on-side storage location for geomembrane material should be level, smooth, elevated and dry (not wooden pallets). The storage place should be protected from theft and vandalism, and should be adjacent to the area to be lined. The Contractor shall provide a suitable storage site which will protect the geomembrane from punctures, abrasions, excessive moisture and dirt.

7.4 Handling - The materials are to be handled so as to prevent damage. Instructions for moving geomembrane rolls shall be provided by the Manufacturer upon request.

8.0 WARRANTY

8.1 The material shall be warranted, on a pro-rata basis against manufacturer's defects for a period of 5 years from the date of geomembrane installation.

8.2 The installation shall be warranted against defects in workmanship for a period of 1 year from the date of geomembrane completion.

9.0 GEOMEMBRANE

9.1 The material shall be smooth/textured polyethylene geomembrane as shown on the drawings.

9.2 Resin

9.2.1 Resin shall be new, first quality, compounded and manufactured specifically for producing geomembrane.

9.2.2 Do not intermix resin types.

9.2.3 Natural resin (without carbon black) shall meet the following additional requirements.

Property	Test Method[1]	HDPE Resin
Density (g/cm^3)	ASTM D 792 (B) or D 1505	0.932 - 0.940
OIT (minutes)	ASTM D 3895 (1 atm, 200 °C)	>100

[1] All procedures and values are subject to change without prior notification.

9.3 Geomembrane Rolls

9.3.1 Do not exceed a combined maximum total of 1 percent by weight of additives other than carbon black.

9.3.2 Geomembrane shall be free of holes, pinholes, bubbles. blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.

9.3.3 Geomembrane material is to be supplied in roll form. Each roll is to be identified with labels indicating both number, thickness, length, width and Manufacturer.

9.3.4 All liner sheets produced at the factory shall be inspected prior to shipment for compliance with the physical appearance requirements listed in previous section and be tested by an acceptable method of inspecting for pinholes. If pinholes are located, identified and indicated during manufacturing, these pinholes may be corrected during installation.

9.4 Smooth surfaced geomembrane shall meet the minimum requirements shown in Table 1.1.

9.5 Textured surfaced geomembrane shall meet the minimum requirements shown in Table 1.2. Note that both FrictionFlex® and coextuded textured geomembranes are listed. The liner type for this particular project shall be __________.

9.6 Extrudate Rod or Bead

9.6.1 Extrudate material shall be made from same type resin as the geomembrane.

9.6.2 Additives shall be thoroughly dispersed.

9.6.3 Shall be free of contamination by moisture or foreign matter.

10.0 EQUIPMENT

10.1 Welding equipment and accessories shall meet the following requirements.

10.1.1 Gauges showing temperatures in apparatus (extrusion welder) or wedge (wedge welder) shall be present.

10.1.2 An adequate number of welding apparati shall be available to avoid delaying work.

10.1.3 Power source capable of providing constant voltage under combined line load shall be used.

11.0 DEPLOYMENT

11.1 Assign each panel a simple and logical identifying code. The coding system shall be subject to approval and shall be determined at the job site.

11.2 Visually inspect the geomembrane during deployment for imperfections and mark faulty or suspect areas.

11.3 Deployment of the geomembrane panels shall conform to the following requirements.

11.3.1 Unroll geomembrane panels using methods that will not damage geomembrane and will protect underlying surface from damage (i.e., spreader bar - protected equipment bucket).

11.3.2 Place ballast (commonly sandbags) on geomembrane which will not damage geomembrane to prevent wind uplift.

11.3.3 Personnel walking on geomembrane shall not engage in activities or wear shoes that could damage the geomembrane. Smoking will not be permitted on the geomembrane.

11.3.4 Do not allow heavy vehicular traffic directly on geomembrane. Rubber-tired ATV's and trucks are acceptable if wheel contact is less than 6 psi.

11.3.5 Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.

11.4 Sufficient material (slack) shall be provided to allow for geomembrane expansion and contraction.

12.0 FIELD SEAMING

12.1 Seams shall meet the following requirements.

12.1.1 To the maximum extent possible, orient seams parallel to line of slope, i.e., down and not across slope.

12.1.2 Minimize number of field seams in corners, odd-shaped geometric locations and outside corners.

12.1.3 Slope seams (panels) shall extend a minimum of five-feet beyond the grade break into the flat area.

12.1.4 Use a sequential seam numbering system compatible with panel numbering system that is agreeable to the Consultant and Installer.

12.2 During Welding Operations

12.2.1 Provide at least one Master Welder who shall provide direct supervision over other welders if necessary.

12.3 Extrusion Welding

12.3.1 Hot-air bond adjacent pieces together using procedures that do not damage geomembrane.

12.3.2 Purge welding apparatus of heat-degraded extrudate before welding.

12.3.3 Clean geomembrane surfaces by disc grinder or equivalent.

12.4 Hot Wedge Welding

12.4.1 Welding apparatus shall be a self-propelled device equipped with an electronic controller (same as Section 9.2) which displays applicable temperatures.

12.4.2 Protect against moisture build-up between sheets.

12.4.3 Clean seam area of dust, mud, moisture and debris immediately ahead of the hot wedge welder.

12.5 Trial Welds

12.5.1 Perform trial welds on geomembrane samples to verify welding equipment is operating properly.

12.5.2 No welding equipment or welder shall be allowed to perform production welds until equipment and welders have successfully completed trial weld.

12.5.3 Minimum of two trial welds per day, per welding apparatus, one made prior to the start of work and one completed at mid shift.

12.5.4 Make trial welds under the same surface and environmental conditions as the production welds, i.e., in contact with subgrade and similar ambient temperature.

12.5.5 Cut four, one-inch wide by six-inch long test strips from the trial weld. Quantitatively test specimens for peel adhesion, and then for bonded seam strength (shear).

12.5.6 A trial weld specimen shall pass when the results shown in Table 3 are achieved in both peel and shear test.

- The break, when peel testing, occurs in the liner material itself, not through peel separation (FTB)
- The break is ductile

12.5.7 Repeat the trial weld, in its entirety, when any of the trial weld samples fail in either peel or shear.

12.6 Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. Installer shall demonstrate that acceptable seaming can be performed by completing acceptable trial welds.

12.7 Defects and Repairs

12.7.1 Examine all seams and non-seam areas of the geomembrane for defects, holes, blister, undispersed raw materials, and any sign of contamination by foreign matter.

12.7.2 Repair and non-destructively test each suspect location in both seam and non-seam areas. Do not cover geomembrane at locations which have been repaired until test results with passing values are available.

13.0 FIELD QUALITY ASSURANCE

13.1 General - The Manufacturer, Fabricator and Installer shall participate in and conform with all terms and requirements of the Owner's quality assurance program. The Contractor shall be responsible for assuring this participation. Quality assurance requirements are as specified in this Section and in the Field Installation Quality Assurance Manual if it is included in the contract.

13.2 Field Testing

13.2.1 Non-destructively test all field seams over their full length using a vacuum test unit, air pressure (for double fusion seams only), or other approved methods. Non-destructive testing may be carried out as the seaming progresses or at completion of all field seaming.

13.2.2 Vacuum Testing:

- The equipment shall consist of the following: 1) A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft gasket attached to the bottom, or valve assembly, and a vacuum gauge, 2) A vacuum pump assembly, and 3) A soapy solution.
- Test Procedure is performed as follows: 1) Apply soapy solution to the seam. 2) Place vacuum box over the entire wetted seam area, 3) Ensure that a leak-tight seal is created, 4) Apply a vacuum of at least 5 psig, 5) Examine the geomembrane through the viewing window for the presence of soap bubbles for not fewer than ten seconds, and 6) All areas where soap bubbles appear shall be marked and repaired.

13.2.3 Air Pressure Testing (for double seam air channel)

- The equipment shall consist of the following: 1) An air pump or tank equipped with pressure gauge capable of generating and sustaining pressure over 30 psi, 2) A sharp, hollow needle, or other approved pressure feed device equipped with a pressure gauge, and 3) A hot air gun or other device to seal the ends of the air channel.
- Test Procedure is performed as follows: 1) Seal both ends of seam to be tested, insert air needle into the air channel, and pressurize to at least 25 psi, 2) If pressure loss exceeds 4 psi or does not stabilize after 5 minutes, locate faulty area and repair, 3) Puncture opposite end of seam to release air. If blockage is present, locate and test seam on both sides of blockage. A pressure gauge at both ends of the seam will also be acceptable, and 4) Remove needle or other approved pressure feed device and seal penetration holes by extrusion welding.

13.2.4 Destructive Testing (performed by Consultant with assistance from Installer)

- Location and Frequency of Testing: 1) Collect destructive test samples at a frequency of one every 500 feet of seamed length and 2) Test locations will be determined after seaming.
- Sampling Procedures are performed as follows: 1) Installer shall cut samples at locations designated by the Consultant as the seaming progresses in order to obtain laboratory test results before the geomembrane is covered, and 2) Consultant will number each sample and mark sample number and location on the installation layout drawing.
- Installer shall repair all holes in the geomembrane resulting from destructive sampling. Repair and test the continuity of the repair in accordance with these Specifications.
- Samples shall be twelve (12) inches wide by minimal length with the seam centered lengthwise. Cut a 2-inch wide strip from each end of the sample for field testing. Cut the remaining sample into two parts for distribution as follows: 1) One portion for the Installer: 12 inches by 12 inches, 2) One portion for Owner's Third Party laboratory testing: 12 inches by 18 inches (maximum), and 3) Additional Samples may be obtained if required.
- Testing: 1) Test the 10 strips specified in above paragraph in peel (5 each) and shear (5 each), 2) Test strips shall meet minimum peel and shear value requirements, 3) If any field test sample fails, follow procedures outlined in Section 13.3 below, and 4) For double wedge seam samples, the outside (top) weld is considered to be the primary weld and shall be the weld tested.

13.3 Failed Seam Procedures

13.3.1 The following procedure shall be used when there is a destructive test failure.

- The Installer shall follow one of two options: 1) Reconstruct the seam between any two passed test locations or 2) Trace the weld to an intermediate location at least 10 feet minimum or to where seam ends, in both directions from the location of the failed test. Check next seam welded using same welding device if required to obtain additional sample, i.e., if one side of the seam is fewer than 10 feet long.
- Obtain four, one-inch samples at both locations for an additional field test.
- If the samples pass, then the seam shall be reconstructed or capped between the test sample locations.
- If any sample fails, the process shall be repeated to establish the zone in which the seam shall be reconstructed.

13.4 Acceptable seams shall be bounded by two locations from which samples have passed destructive tests.

14.0 REPAIR PROCEDURES

14.1 Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.

14.2 Repair any portion of unsatisfactory geomembrane or seam area failing a destructive or non-destructive test. Installer shall be responsible for repair of damaged or defective areas. Agreement upon the appropriate repair method shall be decided between the Consultant and the Installer. Procedures available include the following.

14.2.1 Patching - Used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter

14.2.2 Abrading and Re-welding - Used to repair small seam sections

14.2.3 Spot Welding - Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced

14.2.4 Capping - Used to repair large lengths of failed seams

14.2.5 Flap Welding - Used to extrusion weld the flap (excess outer portion) of a fusion weld in lieu of a full cap

14.2.6 Removing the unacceptable seam and replace with new material

14.3 In addition, the following procedures shall be observed.

14.3.1 Surfaces of the polyethylene which are to be repaired by extrusion welds shall be lightly abraded to assure cleanliness.

14.3.2 All geomembrane surfaces shall be clean and dry at the time of repair.

14.3.3 Extend patches or caps at least 6 inches for extrusion weld and 4 inches for wedge weld beyond the edge of the defect, and round all corners of patch material.

14.4 Repair Verification

14.4.1 Number and log each patch repair (performed by Consultant)

14.4.2 Non-destructively test each repair using methods specified in this Specification

15.0 MEASUREMENT AND PAYMENT

Payment for geomembrane installation will be as per contract unit price per square foot, as measured parallel to liner surface, including designed anchor trench material and is based upon net lined area. Net lined area is defined to be the true area of all surfaces to be lined plus designed burial in all anchor trenches, rubsheets, and sacrificial layers. Prices shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals. Prices also include doing all the work involved in performing geomembrane installation completely as shown on the drawing, as specified herein, and as directed by the Engineer.

Table 1.1: Minimum Values for Smooth HDPE Geomembranes

Property	Test Method	30	40	60	80	100
Minimum Thickness [mil]	ASTM D 751, D 1593 or D 5199	27	36	54	72	90
Density [g/cm^3]	ASTM D 792 (B) or D 1505	0.940	0.940	0.940	0.940	0.940
Carbon Black Content [%]	ASTM D 1603, modified	2.0	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D 3015	A2	A2	A2	A2	A2
Tensile Properties: (each direction)	ASTM D 638 Type IV, 2 ipm					
Strength at Yield [lb/in]	NSF 54 modified	65	86	130	173	216
Strength at Break [lb/in]		122	162	243	324	405
Elongation at Yield [%]	(1.3" gauge length)	13	13	13	13	13
Elongation at Break [%]	(2.5" gauge length)	560	560	560	560	560
Tear Resistance [lb]	ASTM D 1004	22	30	45	60	75
Puncture Resistance [lb]	FTMS 101, Method 2065	39	52	80	105	130
ESCR [hours]	ASTM D 1693 (B)	1500	1500	1500	1500	1500
Dimensional Stability [% change]	ASTM D 1204 (1 hr. at 100 °C)	± 2	± 2	± 2	± 2	± 2

Table 1.2: Minimum Values for Coextruded Textured HDPE Geomembranes

Property	Test Method	30	40	60	80	100
Minimum Thickness [mil]	ASTM D 751, D 1593, D 5199 or GRI GM8	27	36	54	72	90
Density [g/cm^3]	ASTM D 792 (B) or D 1505	0.940	0.940	0.940	0.940	0.940
Carbon Black Content [%]	ASTM D 1603, modified	2.0	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D 3015	A2	A2	A2	A2	A2
Tensile Properties: (each direction)[1]	ASTM D 638 Type IV, 2 ipm					
Strength at Yield [lb/in]	NSF 54 modified	65	86	130	173	216
Strength at Break [lb/in]		38	50	75	100	125
Elongation at Yield [%]	(1.3" gauge length)	13	13	13	13	13
Elongation at Break [%]	(2.5" gauge length)	120	120	120	120	120
Tear Resistance [lb]	ASTM D 1004	22	30	45	60	75
Puncture Resistance [lb]	FTMS 101, Method 2065	39	52	80	105	130
ESCR [hours][2]	ASTM D 1693 (B)	1500	1500	1500	1500	1500
Dimensional Stability [% change]	ASTM D 1204 (1 hr. at 100 °C)	± 2	± 2	± 2	± 2	± 2

1 The combination of stress concentrations due to coextrusion texture geometry and the small specimen size results in large variation of test results. Therefore, these tensile prope4rties are minimum average roll values.
2 ESCR for coextruded textured material is conducted on representative smooth membrane samples.

Table 1.3: Minimum Values for FrictionFlex® Textured HDPE Geomembranes

Property	Test Method	40	60	80	100
Minimum Thickness [mil]	ASTM D 751, D 1593, D 5199 or GRI GM8	36	54	72	90
Density [g/cm^3]	ASTM D 792 (B) or D 1505	0.940	0.940	0.940	0.940
Carbon Black Content [%]	ASTM D 1603, modified	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D 3015	A2	A2	A2	A2
Tensile Properties: (each direction)	ASTM D 638 Type IV, 2 ipm				
Strength at Yield [lb/in]	NSF 54 modified	86	130	173	216
Strength at Break [lb/in]		162	243	324	405
Elongation at Yield [%]	(1.3" gauge length)	13	13	13	13
Elongation at Break [%]	(2.5" gauge length)	500	560	560	560
Tear Resistance [lb]	ASTM D 1004	30	45	60	75
Puncture Resistance [lb]	FTMS 101, Method 2065	52	80	105	130
ESCR [hours]	ASTM D 1693 (B)	1500	1500	1500	1500
Dimensional Stability [% change]	ASTM D 1204 (1 hr. at 100 °C)	± 2	± 2	± 2	± 2

Table 2.1: Minimum Weld Values for Smooth HDPE Geomembranes

Property	Test Method	30	40	60	80	100	120
Peel strength (fusion & ext.), ppi	ASTM D 4437	49	65	98	130	162	196
Shear strength (fusion & ext.), ppi	ASTM D 4437	61	81	121	162	203	242

Table 2.2: Minimum Weld Values for FrictionFlex® Textured HDPE Geomembranes (GSE HyperFrictionFlex™)

Property	Test Method	30	40	60	80	100	120
Peel strength (fusion & ext.), ppi	ASTM D 4437	49	65	98	130	162	196
Shear strength (fusion & ext.), ppi	ASTM D 4437	61	81	121	162	203	242

Table 2.3: Minimum Weld Values for Coextruded Textured HDPE Geomembranes (GSE HD Textured™)

Property	Test Method	30	40	60	80	100	120
Peel strength (fusion), ppi	ASTM D 4437	44	60	88	115	143	175
Peel strength (extrusion), ppi	ASTM D 4437	31	42	63	84	105	130
Shear strength (fusion & ext.), ppi	ASTM D 4437	56	76	113	151	189	226

NON-WOVEN GEOTEXTILE

Geomembrane Puncture Protection, Geotextile Selection - Design Calculator

Problem Statement

There are many circumstances where geomembranes are placed on or beneath soils containing relatively large-sized stones. For example, poorly prepared soil subgrade with stones protruding from the surface, and cases where crushed-stoned drainage layers are to be placed above the geomembrane.

In all of these situations, a nonwoven needle-punched geotextile can provide significant puncture protection to the geomembrane. The issue of determining the required mass per unit area of the geotextile becomes critical.

The method presented herein (Koerner, 1998) focuses on the protection of 1.5 mm thick HDPE geomembranes. The method uses the design by function approach.

$$FS = \frac{p_{allow}}{p_{act}}$$

where:

FS	factor of safety against geomembrane puncture
P_{act}	actual pressure due to the landfill contents or surface impoundment
P_{allow}	allowable pressure using different types of geotextiles and site specific conditions.

p_{allow} is determined by the following equation:

$$P_{allow} = \left(50 + 0.00045\frac{M}{H^2}\right)\left[\frac{1}{MF_S * MF_{PD} * MF_A}\right]\left[\frac{1}{RF_{CR} * RF_{CBD}}\right]$$

where:

Symbol	Name	Unit
P_{allow}	allowable pressure	kPa
M	geotextile mass per unit area	g/m2
H	height of the protrusion above the subgrade	m
MF_S	modification factor for protrusion shape	-
MF_{PD}	modification factor for packing density	-

MF_A	modification factor for arching in solids	-
RF_{CR}	reduction factor for long-term creep	-
RF_{CBD}	reduction factor for long-term chemical/biological degradation	-

Modification Factors and Reduction Factors for Geomembrane Protection Design Using Nonwoven Needle-Punched Geotextile

MF_S		MF_{PD}		MF_A	
Angular:	1.0	Isolated	1.0	Hydrostatic	1.0
Subrounded:	0.5	Dense, 38 mm	0.83	Geostatic, shallow	0.75
Rounded:	0.25	Dense, 25 mm	0.67	Geostatic, mod.	0.50
		Dense, 12mm	0.50	Geostatic, deep	0.25

RF_{CBD}		RF_{CR}			
		Protrusion (mm) / Mass per Unit area (g/m^2)	**38**	**25**	**12**
Mild leachate	1.1	Geomembrane alone	N/R	N/R	N/R
Moderate leachate	1.3	270	N/R	N/R	>1.5
Harsh leachate	1.5	550	N/R	1.5	1.3
		1100	1.3	1.2	1.1
		>1100	1.2	1.1	1.0

N/R = Not Recommended

Input Values

FS 3 **Safety Factor against Puncture (>= 3 is recommended)**

d 244 **Depth of material on top of geomembrane (m)**

8.8 **Unit weight of material on top of geomembrane (kN/m3)**

H 0.019 **Protrusion height (m)**

Modification and Reduction Factors

MF_S	0.5
MF_{PD}	0.5
MF_A	0.25
RF_{CR}	1.5
RF_{CBD}	1.3

Calculate Geotextile Mass Per Unit

Solution

Required Geotextile Mass per Unit area 590 g/m^2

17.4 oz/yd2

TENAX® Corporation

Ultra-Vera™ Highly UV Stable Geotextile
UV 1320

Ultra-Vera™ geotextiles have been created to reduce the liability of engineers, contractors, and owners. Project scheduling often pushes existing geotextile product technology to exposure limits that may cause deterioration. The name Ultra-Vera™ is derived from Latin, and means "Most Truth". Specifying Ultra-Vera™, the most durable geotextile, with its application-oriented colors assures that your project will be a success.

Ultra-Vera™ is a highly U.V. stabilized geotextile. Special additives are incorporated to provide high chemical resistance. Specific chemical resistance data is available upon request for chemicals with pH values that range from 2-13. Tests by our laboratory conducted in accordance with ASTM D 4354 sampling and testing frequencies have resulted in the following properties:

90% UV Resistance @ 1000 Hours

Property	Test Methods	Units	Minimum Average Roll Value[1]	Test Frequency
Physical				
Minimum Weight	ASTM D 5261	oz/yd² (g/m²)	32 (1084)	100,000 sf
Mechanical				
Durability	**ASTM G 154**	**U.V. Resistance (1000 hrs)**	**90 %**	**Every Formulation**
Puncture Resistance	ASTM D 4833	lb (N)	270 (1202)	100,000 sf
Tear Strength	ASTM D 4533	lb (N)	215 (957)	100,000 sf
Grab Strength	ASTM D 4632	lb (N)	685 (3048)	100,000 sf
Hydraulic				
Water Flow Rate	ASTM D 4491	gpm/ft² (m/s)	Available	500,000 sf
Permittivity	ASTM D 4491	sec-1	upon request	500,000 sf
Water Permeability	ASTM D 4491	cm/sec	"	500,000 sf
AOS[2]	ASTM D 4751	Sieve size (mm)	200 (0.075)*	500,000 sf
Packaging			**Typical Dimensions**	
• Roll width	Direct Measure	ft (m)	9.0 (2.74)	
• Roll length	Direct Measure	ft (m)	300 (91.4)	
• Roll area	Direct Measure	yd² (m²)	300 (251)	
• Roll weight	Direct Measure	lb (kg)	634 (287)	
• Roll diameter	Direct Measure	in	32	
• Core ID	Direct Measure	in	4.25	
• Labeling	Product code, roll dimensions, finished product lot and roll number.			

1	Values in weaker principle direction. Unless noted otherwise, these values represent minimum average roll values (i.e., calculated as the typical minus two standard deviations statistically yielding a 97.5% degree of confidence that any sample taken during quality assurance testing will exceed the value reported.)
2	Smaller sieve size number represents the maximum average roll value.
3	ASTM D-3786 is no longer a recognized test standard by the American Society for Testing and Materials.
*	Determined at time of manufacturing. Storage and handling conditions that differ from those found in ASTM D 4873-88 may influence these properties.

To alleviate concern for UV exposure, all Tenax Ultra-Vera™ geotextiles are UV stabilized using Hindered Amine Light stabilized polypropylene. Our UV resistance meets or exceeds 90% strength retention for at least 1000 hours.

Hindered Amine Light Stabilizers (HALS) are the most effective of the light stabilizers for polypropylene. HALS work by retarding the photodegradation of plastics by decomposing the radical intermediates formed during the degradation process.

Tenax uses a continuous filament process, which allows us to control the formulation of the extruded polymer by adding increased stabilizers during processing. The UV resistance can be increased far beyond that of other geotextiles and therefore extend the time Ultra-Vera™ may be left uncovered without damage or degradation.

TENAX Engineered for Life

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9/1/02

LEACHATE COLLECTION PIPING

Chet,

I would like to confirm the details of our phone conversation today. We recommend our 6" 1500 psi internally rated product for you application. Depending on how many slots and the % open area you require we may have to go up to one of our heavier products like 1750, 2000, 2250 or 2500 psi. Obviously the more slots we cut into the pipe the weaker it will become. Unfortunately it is very hard to test the performance derogation when the pipe is slotted. We do have experience we can rely on running our down hole casing products which were slotted. One of my concerns was the possibility of heavy equipment running over the pipe with very little cover. This could be a problem with the bigger sizes and again may be a good reason to go to heavier pipe. Either way we should be able to accommodate your requirement.

Following is my understanding of the application.

It is a landfill where we will see up to 1200 ft of cover with a density of 1500lbs/cu.yard
The temperature is ambient and there will be no pressure.
The system is a grid of pipe and fittings which is slotted and gravel packed for the purpose of collecting waste leach water with a PH of 5 to 8.5
It is 1000 acre site and you estimate that you will need about 165,000 ft. of pipe and fittings
There will be several smaller branches coming of the main lines.
the price of the 6" 1500 line pipe is $11.13/ft. (I1515GS)

I hope this agrees with your understanding. We look forward hearing more about you application.
Regards
Steve

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VFPE GEOMEMBRANE SPECIFICATION

SPECIFICATIONS FOR VERY FLEXIBLE POLYETHYLENE (VFPE) GEOMEMBRANE

1.0 SUMMARY - This section includes specifications and guidelines for manufacturing and installing geomembrane.

2.0 REFERENCES

Note: Test equipment and procedures are used which enable effective and economical confirmation that the product will conform to specifications based on the noted procedures. Some test procedures have been modified for application to geosynthetics. All procedures and values are subject to change without prior notification.

2.1 American Society for Testing and Materials (ASTM)

2.1.1 D 638 Standard Test Method for Tensile Properties of Plastics
2.1.2 D 792 Standard Test Method for Specific Gravity and Density of Plastics by Displacement
2.1.3 D 1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
2.1.4 D 1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
2.1.5 D 1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
2.1.6 D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
2.1.7 D 1593 Specification for Nonrigid Vinyl Chloride Plastic Sheeting
2.1.8 D 1603 Test Method for Carbon Black in Olefin Plastics
2.1.9 D 1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics
2.1.10 D 3015 Standard Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds
2.1.11 D 4437 Practice for Determining Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes

2.2 Federal Test Method Standards - 101 Puncture Resistance

2.3 NSF International - Standard 54 Flexible Membrane Liners

3.0 DEFINITIONS

3.1 Lot: A quantity of resin (usually the capacity of one rail car) used in the manufacture of polyethylene geomembrane rolls. The finished roll will be identified by a roll number traceable to the resin Lot used.

3.2 Construction Quality Assurance Consultant: Party, independent from Manufacturer and Installer, that is responsible for observing and documenting activities related to quality assurance during the lining system construction.

3.3 Engineer: The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications.

3.4 Geomembrane Manufacturer: The party responsible for manufacturing the geomembrane rolls.

3.5 Geosynthetic Quality Assurance Laboratory (Testing Laboratory): Party, independent from the Owner, Manufacturer, and Installer, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing usually under the direction of the Owner.

3.6 Installer: The party responsible for field handling, transporting, storing, deploying, seaming, seam testing.

3.7 Panel: The unit area of geomembrane that will be seamed in the field. A panel is identified as a roll or portion of a roll that is larger than 100 square feet.

3.8 Subgrade Surface: The soil layer surface which immediately underlies the geosynthetic material(s).

4.0 SUBMITTALS POST-AWARD

4.1 Conform to pertinent provisions of Specification Section __________, Submittals.

4.2 Furnish the following product data, in writing, to the Engineer prior to installation of the geomembrane material.

4.2.1 Certify that geomembrane manufacturer is listed by NSF International.

4.2.2 Resin Data shall include the following.

- Certification stating that the resin meets the specification requirements (see Section 9.2)
- Certification stating all resin is from the same Manufacturer (see Section 9.2)
- Copy of Quality Assurance/Quality Control certificates issued by Geomembrane Manufacturer and resin supplier shall be submitted

4.2.3 Geomembrane Roll

- Certification stating that the resin meets the specification requirements (see Section 9.2)
- Statement certifying no reclaimed polymer is added to resin (product run may be recycled - see Section 9.2)
- Copy of quality assurance certificates issued by Geomembrane Manufacturer shall be furnished (See Section 9.2)

4.2.4 Extrudate resins and/or rod shall be certified that all extrudate is from one Manufacturer, is the same resin type, and was obtained from the same resin supplier as the resin used to manufacture the geomembrane rolls.

4.3 Furnish the following information to the Engineer and Owner prior to installation

4.3.1 Installation layout drawings-Submit drawings showing proposed panel layout including field seams and details. These drawings shall be approved prior to installing the geomembrane. This approval will be for concept only and actual panel placement will be determined by site conditions.

4.3.2 Installer's geosynthetic Field Installation Quality Assurance Plan

4.4 Submittals on a daily basis during installation

4.4.1 Subgrade Acceptance Forms

4.4.2 All QC Documentation and Field Testing Results (Destructive & Non-Destructive Test Results)

4.5 Submit the following to the Engineer upon completion of installation

4.5.1 Certificate stating the geomembrane has been installed in accordance with the Contract Documents

4.5.2 Material and installation warranties

4.5.3 As-built drawings showing actual Geomembrane panel placement and seams including typical anchor trench

5.0 QUALITY ASSURANCE

5.1 The Owner will engage and pay for the services of a Geosynthetic Quality Assurance Consultant and Laboratory to monitor geomembrane installation.

6.0 QUALIFICATIONS

6.1 Geomembrane Manufacturer

6.1.1 Geomembrane shall be manufactured by one of the following manufacturer's (or approved equal).

- GSE Lining Technology, Inc.

6.1.2 The manufacturer shall have manufactured a minimum of 10,000,000 square feet of HDPE geomembrane during the last year.

6.2. Installer

6.2.1 Installation shall be performed by one of the following installation companies (or approved equal).

- GSE Lining Technology, Inc.
- GSE authorized dealer installers

6.2.2 The Installer shall have installed a minimum of [ ] square feet of HDPE geomembrane during the last [ ] years.

6.2.3 The Installer shall have worked in a similar capacity on at least [ ] projects similar in complexity to the project described in the contract documents, and with at least [ ] square feet of HDPE geomembrane installation on each project.

6.2.4 The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.

6.2.5 The Master Welder shall have completed a minimum of 1,000,000 square feet of geomembrane seaming work using the type of seaming apparatus proposed for use on this Project.

7.0 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

7.1. Labeling - Each roll of geomembrane delivered to the site shall be labeled by the manufacturer. The label shall clearly state the manufacturer's name, product identification, thickness, length, width and roll number. The label shall be found on either of the endcaps, an inside edge of the core, and outside the core.

7.2. Delivery - The rolls of liner shall be packaged and shipped by appropriate means to prevent damage to the material and to facilitate off-loading.

7.3 Storage - The on-side storage location for geomembrane material should be level, smooth, elevated and dry (not wooden pallets). The storage place should be protected from theft and vandalism, and should be adjacent to the area to be lined. The Contractor shall provide a suitable storage site which will protect the geomembrane from punctures, abrasions, excessive moisture and dirt.

7.4 Handling - The materials are to be handled so as to prevent damage. Instructions for moving geomembrane rolls shall be provided by the Manufacturer upon request.

8.0 WARRANTY

8.1 The material shall be warranted, on a pro-rata basis against manufacturer's defects for a period of 5 years from the date of geomembrane completion.

8.2 The installation shall be warranted against defects in workmanship for a period of 1 year from the date of geomembrane installation.

9.0 GEOMEMBRANE

9.1 The material shall be smooth/textured polyethylene geomembrane as shown on the drawings.

9.2 Resin

9.2.1 Resin shall be new, first quality, compounded and manufactured specifically for producing geomembrane.

9.2.2 Do not intermix resin types.

9.2.3 Natural resin (without carbon black) shall meet the following additional requirements.

Property	Test Method[1]	VFPE Resin
Density (g/cm^3)	ASTM D 792 (B) or D 1505	0.915-0.920
OIT (minutes)	ASTM D 3895 (1 atm, 200 °C)	>100

[1] All procedures and values are subject to change without prior notification.

9.3 Geomembrane Rolls

9.3.1 Do not exceed a combined maximum total of 1 percent by weight of additives other than carbon black.

9.3.2 Geomembrane shall be free of holes, pinholes, bubbles. blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.

9.3.3 Geomembrane material is to be supplied in roll form. Each roll is to be identified with labels indicating both number, thickness, length, width and Manufacturer.

9.3.4 All liner sheets produced at the factory shall be inspected prior to shipment for compliance with the physical appearance requirements listed in previous section and be tested by an acceptable method of inspecting for pinholes. If pinholes are located, identified and indicated during manufacturing, these pinholes may be corrected during installation.

9.4 Smooth surfaced geomembrane shall meet the minimum requirements shown in Table 1.1.

9.5 Textured surfaced geomembrane shall meet the minimum requirements shown in Table 1.2.

9.6 Extrudate Rod or Bead

9.6.1 Extrudate material shall be made from same type resin as the geomembrane.

9.6.2 Additives shall be thoroughly dispersed.

9.6.3 Shall be free of contamination by moisture or foreign matter.

10.0 EQUIPMENT

10.1 Welding equipment and accessories shall meet the following requirements.

10.1.1 Gauges showing temperatures in apparatus (extrusion welder) or wedge (wedge welder) shall be present.

10.1.2 An adequate number of welding apparati shall be available to avoid delaying work.

10.1.3 Power source capable of providing constant voltage under combined line load shall be used.

11.0 DEPLOYMENT

11.1 Assign each panel a simple and logical identifying code. The coding system shall be subject to approval and shall be determined at the job site.

11.2 Visually inspect the geomembrane during deployment for imperfections and mark faulty or suspect areas.

11.3 Deployment of the geomembrane panels shall conform to the following requirements.

11.3.1 Unroll geomembrane panels using methods that will not damage geomembrane and will protect underlying surface from damage (i.e., spreader bar - protected equipment bucket).

11.3.2 Place ballast (commonly sandbags) on geomembrane which will not damage geomembrane to prevent wind uplift.

11.3.3 Personnel walking on geomembrane shall not engage in activities or wear shoes that could damage the geomembrane. Smoking will not be permitted on the geomembrane.

11.3.4 Do not allow heavy vehicular traffic directly on geomembrane. Rubber-tired ATV's and trucks are acceptable if wheel contact is less than 6 psi.

11.3.5 Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.

11.4 Sufficient material (slack) shall be provided to allow for geomembrane expansion and contraction.

12.0 FIELD SEAMING

12.1 Seams shall meet the following requirements.

12.1.1 To the maximum extent possible, orient seams parallel to line of slope, i.e., down and not across slope.

12.1.2 Minimize number of field seams in corners, odd-shaped geometric locations and outside corners.

12.1.3 Slope seams (panels) shall extend a minimum of five-feet beyond the grade break into the flat area.

12.1.4 Use a sequential seam numbering system compatible with panel numbering system that is agreeable to the Consultant and Installer.

12.2 During Welding Operations

12.2.1 Provide at least one Master Welder who shall provide direct supervision over other welders if necessary.

12.3 Extrusion Welding

12.3.1 Hot-air bond adjacent pieces together using procedures that do not damage geomembrane.

12.3.2 Purge welding apparatus of heat-degraded extrudate before welding.

12.3.3 Clean geomembrane surfaces by disc grinder or equivalent.

12.4 Hot Wedge Welding

12.4.1 Welding apparatus shall be a self-propelled device equipped with an electronic controller (same as Section 9.2) which displays applicable temperatures.

12.4.2 Protect against moisture build-up between sheets.

12.4.3 Clean seam area of dust, mud, moisture and debris immediately ahead of the hot wedge welder.

12.5 Trial Welds

12.5.1 Perform trial welds on geomembrane samples to verify welding equipment is operating properly.

12.5.2 No welding equipment or welder shall be allowed to perform production welds until equipment and welders have successfully completed trial weld.

12.5.3 Minimum of two trial welds per day, per welding apparatus, one made prior to the start of work and one completed at mid shift.

12.5.4 Make trial welds under the same surface and environmental conditions as the production welds, i.e., in contact with subgrade and similar ambient temperature.

12.5.5 Cut four, one-inch wide by six-inch long test strips from the trial weld. Quantitatively test specimens for peel adhesion, and then for bonded seam strength (shear).

12.5.6 A trial weld specimen shall pass when the results shown in Table 3 are achieved in both peel and shear test.

- The break, when peel testing, occurs in the liner material itself, not through peel separation (FTB)
- The break is ductile

12.5.7 Repeat the trial weld, in its entirety, when any of the trial weld samples fail in either peel or shear.

12.6 Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. Installer shall demonstrate that acceptable seaming can be performed by completing acceptable trial welds.

12.7 Defects and Repairs

12.7.1 Examine all seams and non-seam areas of the geomembrane for defects, holes, blister, undispersed raw materials, and any sign of contamination by foreign matter.

12.7.2 Repair and non-destructively test each suspect location in both seam and non-seam areas. Do not cover geomembrane at locations which have been repaired until test results with passing values are available.

13.0 FIELD QUALITY ASSURANCE

13.1 General - The Manufacturer, Fabricator and Installer shall participate in and conform with all terms and requirements of the Owner's quality assurance program. The Contractor shall be responsible for assuring this participation. Quality assurance requirements are as specified in this Section and in the Field Installation Quality Assurance Manual if it is included in the contract.

13.2 Field Testing

13.2.1 Non-destructively test all field seams over their full length using a vacuum test unit, air pressure (for double fusion seams only), or other approved methods. Non-destructive testing may be carried out as the seaming progresses or at completion of all field seaming.

13.2.2 Vacuum Testing:

- The equipment shall consist of the following: 1) A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft gasket attached to the bottom, or valve assembly, and a vacuum gauge, 2) A vacuum pump assembly, and 3) A soapy solution.

- Test Procedure is performed as follows: 1) Apply soapy solution to the seam. 2) Place vacuum box over the entire wetted seam area, 3) Ensure that a leak-tight seal is created, 4) Apply a vacuum of at least 5 psig, 5) Examine the geomembrane through the viewing window for the presence of soap bubbles for not fewer than ten seconds, and 6) All areas where soap bubbles appear shall be marked and repaired.

13.2.3 Air Pressure Testing (for double seam air channel)

- The equipment shall consist of the following: 1) An air pump or tank equipped with pressure gauge capable of generating and sustaining pressure over 30 psi, 2) A sharp, hollow needle, or other approved pressure feed device equipped with a pressure gauge, and 3) A hot air gun or other device to seal the ends of the air channel.
- Test Procedure is performed as follows: 1) Seal both ends of seam to be tested, insert air needle into the air channel, and pressurize to at least 25 psi, 2) If pressure loss exceeds 4 psi or does not stabilize after 5 minutes, locate faulty area and repair, 3) Puncture opposite end of seam to release air. If blockage is present, locate and test seam on both sides of blockage. A pressure gauge at both ends of the seam will also be acceptable, and 4) Remove needle or other approved pressure feed device and seal penetration holes by extrusion welding.

13.2.4 Destructive Testing (performed by Consultant with assistance from Installer)

- Location and Frequency of Testing: 1) Collect destructive test samples at a frequency of one every 500 feet of seamed length and 2) Test locations will be determined after seaming.
- Sampling Procedures are performed as follows: 1) Installer shall cut samples at locations designated by the Consultant as the seaming progresses in order to obtain laboratory test results before the geomembrane is covered, and 2) Consultant will number each sample and mark sample number and location on the installation layout drawing.
- Installer shall repair all holes in the geomembrane resulting from destructive sampling. Repair and test the continuity of the repair in accordance with these Specifications.
- Samples shall be twelve (12) inches wide by minimal length with the seam centered lengthwise. Cut a 2-inch wide strip from each end of the sample for field testing. Cut the remaining sample into two parts for distribution as follows: 1) One portion for the Installer: 12 inches by 12 inches, 2) One portion for Owner's Third Party laboratory testing: 12 inches by 18 inches (maximum), and 3) Additional Samples may be obtained if required.
- Testing: 1) Test the 10 strips specified in above paragraph in peel (5 each) and shear (5 each), 2) Test strips shall meet minimum peel and shear value requirements, 3) If any field test sample fails, follow procedures outlined in Section 13.3 below, and 4) For double wedge seam samples, the outside (top) weld is considered to be the primary weld and shall be the weld tested.

13.3 Failed Seam Procedures

13.3.1 The following procedure shall be used when there is a destructive test failure.

- The Installer shall follow one of two options: 1) Reconstruct the seam between any two passed test locations or 2) Trace the weld to an intermediate location at least 10 feet minimum or to where seam ends, in both directions from the location of the failed test. Check next seam welded using same welding device if required to obtain additional sample, i.e., if one side of the seam is fewer than 10 feet long.

- Obtain four, one-inch samples at both locations for an additional field test.
- If the samples pass, then the seam shall be reconstructed or capped between the test sample locations.
- If any sample fails, the process shall be repeated to establish the zone in which the seam shall be reconstructed.

13.4 Acceptable seams shall be bounded by two locations from which samples have passed destructive tests.

14.0 REPAIR PROCEDURES

14.1 Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.

14.2 Repair any portion of unsatisfactory geomembrane or seam area failing a destructive or non-destructive test. Installer shall be responsible for repair of damaged or defective areas. Agreement upon the appropriate repair method shall be decided between the Consultant and the Installer. Procedures available include the following.

14.2.1 Patching - Used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter

14.2.2 Abrading and Re-welding - Used to repair small seam sections

14.2.3 Spot Welding - Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced

14.2.4 Capping - Used to repair large lengths of failed seams

14.2.5 Flap Welding - Used to extrusion weld the flap (excess outer portion) of a fusion weld in lieu of a full cap

14.2.6 Removing the unacceptable seam and replace with new material

14.3 In addition, the following procedures shall be observed.

14.3.1 Surfaces of the polyethylene which are to be repaired by extrusion welds shall be lightly abraded to assure cleanliness.

14.3.2 All geomembrane surfaces shall be clean and dry at the time of repair.

14.3.3 Extend patches or caps at least 6 inches for extrusion weld and 4 inches for wedge weld beyond the edge of the defect, and round all corners of patch material.

14.4 Repair Verification

14.4.1 Number and log each patch repair (performed by Consultant)

14.4.2 Non-destructively test each repair using methods specified in this Specification

15.0 MEASUREMENT AND PAYMENT

Payment for geomembrane installation will be as per contract unit price per square foot, as measured parallel to liner surface, including designed anchor trench material and is based upon net lined area. Net lined area is defined to be the true area of all surfaces to be lined plus designed burial in all anchor trenches, rubsheets, and sacrificial layers. Prices shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals. Prices also include doing all the work involved in performing geomembrane installation completely as shown on the drawing, as specified herein, and as directed by the Engineer.

Table 1.1: Minimum Values for Smooth VFPE Geomembranes

Property	Test Method	30	40	60	80.	100
Minimum Thickness [mil]	ASTM D 751, D 1593 or D 5199	27	36	54	72	90
Density [g/cm^3]	ASTM D 792 (B) or D 1505	0.920	0.920	0.920	0.920	0.920
Carbon Black Content [%]	ASTM D 1603, modified	2.0	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D 3015	A2	A2	A2	A2	A2
Tensile Properties: (each direction)	ASTM D 638 Type IV, 2 ipm NSF 54 modified					
Strength at Break [lb/in]		122	160	243	324	405
Elongation at Break [%]	(2.5" gauge length)	780	800	800	800	800
Tear Resistance [lb]	ASTM D 1004	18	24	36	48	60
Puncture Resistance [lb]	FTMS 101, Method 206	40	55	80	110	135
ESCR [hours]	ASTM D 1693 (B)	1500	1500	1500	1500	1500
Dimensional Stability [% change	ASTM D 1204 (1 hr. at 100 °C)	± 2	± 2	± 2	± 2	± 2

Table 1.2: Minimum Values for FrictionFlex® Textured VFPE Geomembranes

Property	Test Method	30	40	60	80	100
Minimum Thickness [mil]	ASTM D 751, D 1593, D 5199 or GRI GM8	27	36	54	72	90
Density [g/cm^3]	ASTM D 792 (B) or D 1505	0.920	0.920	0.920	0.920	0.920
Carbon Black Content [%]	ASTM D 1603, modified	2.0	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D 3015	A2	A2	A2	A2	A2
Tensile Properties: (each direction)	ASTM D 638 Type IV, 2 ipm NSF 54 modified					
Strength at Break [lb/in]		113	150	243	324	405
Elongation at Break [%]	(2.5" gauge length)	500	500	600	800	800
Tear Resistance [lb]	ASTM D 1004	18	24	36	48	60
Puncture Resistance [lb]	FTMS 101, Method 206	40	55	80	110	135
ESCR [hours]	ASTM D 1693 (B)	1500	1500	1500	1500	1500
Dimensional Stability [% change	ASTM D 1204 (1 hr. at 100 °C)	± 2	± 2	± 2	± 2	± 2

Table 2.1: Minimum Weld Values for Smooth VFPE Geomembranes

Property	Test Method	30	40	60	80
Peel strength (fusion & ext.), ppi	ASTM D 4437	36	48	72	96
Shear strength (fusion & ext.), ppi	ASTM D 4437	40	56	84	112

Table 2.2: Minimum Weld Values for FrictionFlex® Textured VFPE Geomembranes

Property	Test Method	30	40	60	80
Peel strength (fusion), ppi	ASTM D 4437	36	40	72	96
Shear strength (fusion & ext.), ppi	ASTM D 4437	40	56	84	112

BI-PLANER GEOCOMPOSITE DRAINAGE LAYER

Corporation

Ultra-Vera™ Highly UV Stable Geocomposite

UVB 5065-2

Ultra-Vera™ Geocomposites have been created to reduce the liability of engineers, contractors, and owners. Project scheduling often pushes existing geotextile product technology to exposure limits that may cause deterioration. The name Ultra-Vera™ is derived from Latin, and means "Most Truth". Specifying Ultra-Vera, the most durable geocomposite, with its application-oriented colors assures that your project will be a success.

UVB 5065-2 is a drainage geocomposite made by thermally bonding Tenax UltraVera™ highly UV stabilized, spunbonded, continuous filament, needlepunched, nonwoven, polypropylene 6 ounce per square yard geotextile to both sides of our chemically resistant high density polyethylene 5 mm geonet core. Tenax geocomposites have high compressive strength in order to ensure maximum flow capacity of both liquids and gases under high confining pressures, and exhibit high ply adhesion strengths to ensure performance of the composite as a single unit. Virgin resins used in the production of Tenax geonets consist of at least 97% polyethylene with a melt flow range between 0.1 and 1.0 grams per 10 minutes (ASTM D1238), and a density range of 0.932 to 0.970 grams per cubic centimeter (ASTM D1505). The geocomposite is delivered to the jobsite in roll form with each roll having unique identification and QA tractability. UVB 5065-2 conforms to the property values listed in the tables below.

95% UV Resistance
@ 500 Hours

Property	Test Methods	Units	Value	Specifications[1]	Test Frequency
Geonet Core					
• MD Tensile	ASTM D 5035	ppi (kN/m)	48 (8.4)	MARV	50,000 sf
• Thickness	ASTM D 5199	mil (mm)	200 (5.1)	MARV	50,000 sf
• Compressive Creep[5]	GRI-GS4		In accordance with GC-8 (Data in progress)		
Geotextile properties					
• U.V. Resistance (500 hrs)	**ASTM G 154**	**%**	**95**		
• AOS	ASTM D 4751	US Std. Sieve (mm)	70 (0.212)	MARV	500,000 sf
• Mass/Unit Area	ASTM D 5261	oz/yd^2 (g/m^2)	6 (203)	MARV	100,000 sf
• Water Flow Rate	ASTM D 4491	gpm/ft^2 (lpm/m^2)	135 (5500)	MARV	500,000 sf
• Water Permeability	ASTM D 4491	cm/sec	0.3	MARV	500,000 sf
• Puncture Resistance	ASTM D 4833	lbs (N)	85 (378)	MARV	100,000 sf
• Tear Strength	ASTM D 4533	lbs (N)	65 (289)	MARV	100,000 sf
• Grab Tensile	ASTM D 4632	lbs (N)	170 (756)	MARV	100,000 sf
Geocomposite					
• Roll length	Direct Measure	ft (m)	225 (68.6)	nominal	Each roll
• Roll width	Direct Measure	ft (m)	14 (4.27)	nominal	Each roll
• Core ID	Direct Measure	in (m)	4 (0.1)	nominal	N/A
• Peel Adhesion[2]	ASTM F 904	lb/in (g/in)	1.0 (454)		
• Labeling	Product code, geotextile type, roll dimensions, finished product lot and roll number.				
Hydraulic behavior of geocomposite					
• Performance Transmissivity[3]			**In accordance with GC-8**		

Notes
1 MARV is defined as the one-sided 97.5% confidence limit obtained through long-term data (mean - 2* standard deviations) and represents the minimum allowable sample roll average for each specific test.
2 Peel adhesion ASTM F 904: 2 inch wide strip. Reported value per specimen is average of all computed points between 1" and 5" of separation.
3 Performance based testing in accordance with GC-8 should be conducted to meet specific project conditions. Contact Tenax Corporation for data to verify fitness for use in the intended applications.
4 Geotextile and Geonet Core component properties are tested prior to the lamination process and cannot be tested on the finished geocomposite product.
5 10,000 hour compressive creep testing is in progress and will be available at a later date please contact Tenax if this information is pertinent to your specific needs.

Engineered for Life

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www.tenaxus.com

9/1/02

APPENDIX H
LEACHATE COLLECTION SYSTEM MODELING OUTPUT FILES AND CALCULATIONS

AQUA ENGINEERING, INC.

LEACHATE COLLECTION MODELING
OPEN CELL CASE

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      x:\shire\help\proprecp.D4
TEMPERATURE DATA FILE:        x:\shire\help\protemp.D7
SOLAR RADIATION DATA FILE:    x:\shire\help\prosolar.D13
EVAPOTRANSPIRATION DATA:      x:\shire\help\evapo12.D11
SOIL AND DESIGN DATA FILE:    x:\shire\help\peaknoco.D10
OUTPUT DATA FILE:             x:\shire\help\penocoot.OUT


TIME:  14:29     DATE:   8/ 6/2003


******************************************************************************

     TITLE:  Open Closed Cell

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   0
          THICKNESS                   =     12.00   INCHES
          POROSITY                    =      0.3980 VOL/VOL
          FIELD CAPACITY              =      0.2440 VOL/VOL
          WILTING POINT               =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT  =      0.2048 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	180.00 INCHES
POROSITY	=	0.6710 VOL/VOL
FIELD CAPACITY	=	0.2920 VOL/VOL
WILTING POINT	=	0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00 INCHES
POROSITY	=	0.3980 VOL/VOL
FIELD CAPACITY	=	0.2440 VOL/VOL
WILTING POINT	=	0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-05 CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	180.00 INCHES
POROSITY	=	0.6710 VOL/VOL
FIELD CAPACITY	=	0.2920 VOL/VOL
WILTING POINT	=	0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00 INCHES
POROSITY	=	0.3980 VOL/VOL
FIELD CAPACITY	=	0.2440 VOL/VOL
WILTING POINT	=	0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2440 VOL/VOL

```
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                        LAYER  6
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  18
THICKNESS                    =    180.00    INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                        LAYER  7
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     12.00    INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                        LAYER  8
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  18
THICKNESS                    =    180.00    INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                        LAYER  9
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     12.00    INCHES
POROSITY                     =      0.3980 VOL/VOL
```

```
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER 10
                        --------

         TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  18
THICKNESS                   =    180.00    INCHES
POROSITY                    =      0.6710 VOL/VOL
FIELD CAPACITY              =      0.2920 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER 11
                        --------

         TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =     12.00    INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2460 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER 12
                        --------

         TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  18
THICKNESS                   =    180.00    INCHES
POROSITY                    =      0.6710 VOL/VOL
FIELD CAPACITY              =      0.2920 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER 13
                        --------

         TYPE 1 - VERTICAL PERCOLATION LAYER
```

```
               MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                         LAYER 14
                         --------

           TYPE 1 - VERTICAL PERCOLATION LAYER
               MATERIAL TEXTURE NUMBER  18
THICKNESS                    =    180.00   INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                         LAYER 15
                         --------

           TYPE 1 - VERTICAL PERCOLATION LAYER
               MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                         LAYER 16
                         --------

           TYPE 1 - VERTICAL PERCOLATION LAYER
               MATERIAL TEXTURE NUMBER  18
THICKNESS                    =    180.00   INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                         LAYER 17
```

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

```
THICKNESS                    =     12.00    INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
```

LAYER 18

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

```
THICKNESS                    =    180.00    INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC
```

LAYER 19

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

```
THICKNESS                    =     24.00    INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   1.00000000000      CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

```
SCS RUNOFF CURVE NUMBER             =     79.00
FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =   1000.000  ACRES
EVAPORATIVE ZONE DEPTH              =     12.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      2.458  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =      4.776  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      1.632  INCHES
```

INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	499.713	INCHES
TOTAL INITIAL WATER	=	499.713	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SALT LAKE CITY UTAH

STATION LATITUDE	=	40.76 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.60
START OF GROWING SEASON (JULIAN DATE)	=	117
END OF GROWING SEASON (JULIAN DATE)	=	289
EVAPORATIVE ZONE DEPTH	=	12.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	48.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	39.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	65.00 %

NOTE: PRECIPITATION DATA FOR Bear River Refuge Utah
WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Salt Lake City Utah
WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Salt Lake City Utah
WAS ENTERED BY THE USER.

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.002	0.006	0.000	0.000	0.000
	0.001	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.761	0.771	2.912	1.257	2.700	1.740

	0.450	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0018	0.0001	0.0013	0.0024	0.0010	0.0007
LAYER 19	0.0000	0.0003	0.0018	0.0063	0.0057	0.0053

****

****

ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.028	103158.656	0.21
EVAPOTRANSPIRATION	13.316	48336656.000	99.67
PERC./LEAKAGE THROUGH LAYER 19	0.026608	96585.367	0.20
CHANGE IN WATER STORAGE	-0.011	-39548.035	-0.08
SOIL WATER AT START OF YEAR	499.713	*************	
SOIL WATER AT END OF YEAR	499.702	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-30.602	0.00

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.002	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.759	0.771	2.809	1.257	2.740	1.740

	0.450	0.049	0.160	1.580	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0001	0.0000	0.0010	0.0035	0.0036	0.0003
LAYER 19	0.0040	0.0000	0.0020	0.0017	0.0017	0.0008

****

****

ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98791.867	0.20
EVAPOTRANSPIRATION	13.249	48092928.000	99.17
PERC./LEAKAGE THROUGH LAYER 19	0.018768	68129.031	0.14
CHANGE IN WATER STORAGE	0.065	237288.203	0.49
SOIL WATER AT START OF YEAR	499.702	*************	
SOIL WATER AT END OF YEAR	499.767	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-316.494	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.741	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0031	0.0024	0.0001	0.0023	0.0022	0.0036
	0.0022	0.0024	0.0012	0.0040	0.0036	0.0013

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98389.516	0.20
EVAPOTRANSPIRATION	13.188	47874060.000	98.72
PERC./LEAKAGE THROUGH LAYER 19	0.028447	103263.742	0.21
CHANGE IN WATER STORAGE	0.116	420627.125	0.87
SOIL WATER AT START OF YEAR	499.767	*************	
SOIL WATER AT END OF YEAR	499.883	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	479.992	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.796	2.936	1.230	2.666	1.740

	0.472	0.028	0.164	1.599	0.692	0.217
PERCOLATION/LEAKAGE THROUGH	0.0008	0.0010	0.0045	0.0037	0.0026	0.0020
LAYER 19	0.0000	0.0010	0.0049	0.0050	0.0022	0.0015

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97258.320	0.20
EVAPOTRANSPIRATION	13.329	48382940.000	99.77
PERC./LEAKAGE THROUGH LAYER 19	0.029086	105583.836	0.22
CHANGE IN WATER STORAGE	-0.025	-88955.383	-0.18
SOIL WATER AT START OF YEAR	499.883	*************	
SOIL WATER AT END OF YEAR	499.859	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-6.160	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.790	0.784	2.706	1.257	2.742	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0001	0.0000	0.0014	0.0039	0.0014	0.0048
LAYER 19	0.0086	0.0105	0.0063	0.0063	0.0043	0.0043

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98490.187	0.20
EVAPOTRANSPIRATION	13.191	47883716.000	98.74
PERC./LEAKAGE THROUGH LAYER 19	0.052003	188771.750	0.39
CHANGE IN WATER STORAGE	0.090	326132.812	0.67
SOIL WATER AT START OF YEAR	499.859	*************	
SOIL WATER AT END OF YEAR	499.949	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-289.442	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.740	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0072	0.0078	0.0040	0.0045	0.0042	0.0036
LAYER 19	0.0067	0.0072	0.0058	0.0053	0.0019	0.0002

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98367.797	0.20
EVAPOTRANSPIRATION	13.187	47869304.000	98.71
PERC./LEAKAGE THROUGH LAYER 19	0.058307	211655.641	0.44
CHANGE IN WATER STORAGE	0.087	317159.719	0.65
SOIL WATER AT START OF YEAR	499.949	*************	
SOIL WATER AT END OF YEAR	500.036	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	333.783	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.705	1.257	2.721	1.740

	0.451	0.049	0.160	1.578	0.703	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0000	0.0000	0.0006	0.0017	0.0075	0.0115
	0.0139	0.0102	0.0077	0.0096	0.0108	0.0104

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98300.937	0.20
EVAPOTRANSPIRATION	13.167	47797528.000	98.56
PERC./LEAKAGE THROUGH LAYER 19	0.083856	304397.625	0.63
CHANGE IN WATER STORAGE	0.082	296665.656	0.61
SOIL WATER AT START OF YEAR	500.036	*************	
SOIL WATER AT END OF YEAR	500.118	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-72.996	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.796	2.935	1.230	2.667	1.740

	0.472	0.028	0.164	1.599	0.692	0.217
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0072	0.0029	0.0039	0.0060	0.0078	0.0076
	0.0066	0.0052	0.0024	0.0022	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97298.375	0.20
EVAPOTRANSPIRATION	13.329	48386068.000	99.77
PERC./LEAKAGE THROUGH LAYER 19	0.051852	188221.687	0.39
CHANGE IN WATER STORAGE	-0.048	-174919.734	-0.36
SOIL WATER AT START OF YEAR	500.118	*************	
SOIL WATER AT END OF YEAR	500.070	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	150.793	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.790	0.784	2.706	1.257	2.742	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0000	0.0027	0.0091	0.0079	0.0105	0.0127
	0.0107	0.0090	0.0090	0.0104	0.0094	0.0054

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98209.000	0.20
EVAPOTRANSPIRATION	13.191	47882256.000	98.73
PERC./LEAKAGE THROUGH LAYER 19	0.096815	351438.437	0.72
CHANGE IN WATER STORAGE	0.045	164949.641	0.34
SOIL WATER AT START OF YEAR	500.070	*************	
SOIL WATER AT END OF YEAR	500.115	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-34.321	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.906	1.257	2.682	1.740

	0.450	0.049	0.160	1.580	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0000	0.0008	0.0040	0.0038	0.0065	0.0136
	0.0134	0.0104	0.0147	0.0108	0.0117	0.0086

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97187.914	0.20
EVAPOTRANSPIRATION	13.331	48390264.000	99.78
PERC./LEAKAGE THROUGH LAYER 19	0.098232	356582.562	0.74
CHANGE IN WATER STORAGE	-0.096	-347291.562	-0.72
SOIL WATER AT START OF YEAR	500.115	*************	
SOIL WATER AT END OF YEAR	500.019	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	76.458	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 11

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.739	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0059	0.0046	0.0067	0.0085	0.0087	0.0104
	0.0099	0.0080	0.0065	0.0016	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98400.773	0.20
EVAPOTRANSPIRATION	13.186	47866760.000	98.70
PERC./LEAKAGE THROUGH LAYER 19	0.070838	257140.391	0.53
CHANGE IN WATER STORAGE	0.076	274620.656	0.57
SOIL WATER AT START OF YEAR	500.019	*************	
SOIL WATER AT END OF YEAR	500.095	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-103.882	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 12

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.796	2.936	1.230	2.667	1.740

	0.472	0.028	0.164	1.599	0.692	0.217
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0000	0.0028	0.0084	0.0169	0.0164	0.0102
	0.0113	0.0124	0.0115	0.0090	0.0048	0.0031

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97246.242	0.20
EVAPOTRANSPIRATION	13.329	48385984.000	99.77
PERC./LEAKAGE THROUGH LAYER 19	0.106830	387793.656	0.80
CHANGE IN WATER STORAGE	-0.103	-374321.594	-0.77
SOIL WATER AT START OF YEAR	500.095	*************	
SOIL WATER AT END OF YEAR	499.992	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	115.890	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 13

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.790	0.784	2.706	1.257	2.742	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0018	0.0052	0.0122	0.0163	0.0204	0.0108
	0.0194	0.0201	0.0139	0.0132	0.0105	0.0092

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98349.969	0.20
EVAPOTRANSPIRATION	13.190	47880584.000	98.73
PERC./LEAKAGE THROUGH LAYER 19	0.153102	555761.250	1.15
CHANGE IN WATER STORAGE	-0.010	-37664.797	-0.08
SOIL WATER AT START OF YEAR	499.992	*************	
SOIL WATER AT END OF YEAR	499.981	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-211.605	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 14

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.906	1.257	2.681	1.740

	0.450	0.049	0.160	1.580	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0115	0.0111	0.0087	0.0054	0.0080	0.0043
	0.0061	0.0084	0.0080	0.0068	0.0055	0.0022

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97245.797	0.20
EVAPOTRANSPIRATION	13.330	48386600.000	99.77
PERC./LEAKAGE THROUGH LAYER 19	0.085856	311656.437	0.64
CHANGE IN WATER STORAGE	-0.082	-298881.219	-0.62
SOIL WATER AT START OF YEAR	499.981	*************	
SOIL WATER AT END OF YEAR	499.899	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	197.000	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.741	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0018	0.0072	0.0120
LAYER 19	0.0148	0.0141	0.0085	0.0082	0.0083	0.0074

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98393.641	0.20
EVAPOTRANSPIRATION	13.188	47873868.000	98.72
PERC./LEAKAGE THROUGH LAYER 19	0.082384	299053.375	0.62
CHANGE IN WATER STORAGE	0.062	225767.219	0.47
SOIL WATER AT START OF YEAR	499.899	*************	
SOIL WATER AT END OF YEAR	499.961	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-263.451	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 16

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.796	2.936	1.230	2.666	1.740

	0.472	0.028	0.164	1.599	0.692	0.217
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0093	0.0089	0.0034	0.0067	0.0074	0.0034
	0.0045	0.0068	0.0066	0.0055	0.0035	0.0012

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97267.094	0.20
EVAPOTRANSPIRATION	13.329	48385760.000	99.77
PERC./LEAKAGE THROUGH LAYER 19	0.067191	243904.328	0.50
CHANGE IN WATER STORAGE	-0.063	-230419.922	-0.48
SOIL WATER AT START OF YEAR	499.961	*************	
SOIL WATER AT END OF YEAR	499.898	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	307.725	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 17

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.790	0.784	2.706	1.257	2.714	1.740

	0.450	0.049	0.160	1.580	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0000	0.0000	0.0002	0.0042	0.0072	0.0111
	0.0140	0.0140	0.0089	0.0074	0.0077	0.0088

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98606.234	0.20
EVAPOTRANSPIRATION	13.163	47782972.000	98.53
PERC./LEAKAGE THROUGH LAYER 19	0.083334	302502.031	0.62
CHANGE IN WATER STORAGE	0.086	312839.344	0.65
SOIL WATER AT START OF YEAR	499.898	*************	
SOIL WATER AT END OF YEAR	499.984	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-99.366	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 18

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.741	1.740

	0.451	0.049	0.160	1.578	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0078	0.0080	0.0039	0.0065	0.0048	0.0045
	0.0073	0.0073	0.0058	0.0054	0.0014	0.0002

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98297.641	0.20
EVAPOTRANSPIRATION	13.188	47872596.000	98.71
PERC./LEAKAGE THROUGH LAYER 19	0.062766	227841.016	0.47
CHANGE IN WATER STORAGE	0.082	297995.000	0.61
SOIL WATER AT START OF YEAR	499.984	*************	
SOIL WATER AT END OF YEAR	500.066	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	91.090	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 19

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.906	1.257	2.682	1.740

	0.450	0.049	0.160	1.580	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0000	0.0001	0.0007	0.0039	0.0103	0.0121
	0.0103	0.0086	0.0092	0.0123	0.0086	0.0076

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97299.555	0.20
EVAPOTRANSPIRATION	13.330	48386700.000	99.77
PERC./LEAKAGE THROUGH LAYER 19	0.083627	303566.094	0.63
CHANGE IN WATER STORAGE	-0.080	-290794.375	-0.60
SOIL WATER AT START OF YEAR	500.066	*************	
SOIL WATER AT END OF YEAR	499.986	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	46.329	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.796	2.735	1.230	2.727	1.740

	0.472	0.028	0.165	1.597	0.692	0.217
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0068	0.0028	0.0050	0.0087	0.0095	0.0066
	0.0040	0.0059	0.0051	0.0001	0.0000	0.0006

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98404.219	0.20
EVAPOTRANSPIRATION	13.189	47874500.000	98.72
PERC./LEAKAGE THROUGH LAYER 19	0.055129	200117.047	0.41
CHANGE IN WATER STORAGE	0.089	323806.469	0.67
SOIL WATER AT START OF YEAR	499.986	*************	
SOIL WATER AT END OF YEAR	500.075	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-7.005	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 21

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.742	1.740

	0.451	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0069	0.0065	0.0079	0.0094	0.0132	0.0078
LAYER 19	0.0086	0.0110	0.0089	0.0070	0.0045	0.0052

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ANNUAL TOTALS FOR YEAR 21

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98300.211	0.20
EVAPOTRANSPIRATION	13.190	47880544.000	98.73
PERC./LEAKAGE THROUGH LAYER 19	0.097094	352451.312	0.73
CHANGE IN WATER STORAGE	0.046	165503.547	0.34
SOIL WATER AT START OF YEAR	500.075	*************	
SOIL WATER AT END OF YEAR	500.121	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	21.312	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 22

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.001	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.906	1.257	2.657	1.740

	0.450	0.049	0.160	1.581	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0016	0.0042	0.0057	0.0079	0.0078	0.0071
	0.0066	0.0032	0.0000	0.0003	0.0045	0.0018

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ANNUAL TOTALS FOR YEAR 22

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97372.555	0.20
EVAPOTRANSPIRATION	13.306	48299420.000	99.59
PERC./LEAKAGE THROUGH LAYER 19	0.050430	183061.047	0.38
CHANGE IN WATER STORAGE	-0.023	-83084.109	-0.17
SOIL WATER AT START OF YEAR	500.121	*************	
SOIL WATER AT END OF YEAR	500.098	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	51.414	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 23

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.739	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0013	0.0039	0.0071	0.0095	0.0112	0.0178
LAYER 19	0.0186	0.0134	0.0115	0.0127	0.0127	0.0094

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ANNUAL TOTALS FOR YEAR 23

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98474.156	0.20
EVAPOTRANSPIRATION	13.187	47870040.000	98.71
PERC./LEAKAGE THROUGH LAYER 19	0.128891	467874.906	0.96
CHANGE IN WATER STORAGE	0.017	60374.449	0.12
SOIL WATER AT START OF YEAR	500.098	*************	
SOIL WATER AT END OF YEAR	500.115	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	56.093	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 24

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.796	2.735	1.230	2.725	1.740

	0.472	0.028	0.165	1.597	0.692	0.217
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0008	0.0021	0.0069	0.0080	0.0081	0.0124
	0.0138	0.0186	0.0162	0.0137	0.0106	0.0091

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ANNUAL TOTALS FOR YEAR 24

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98479.453	0.20
EVAPOTRANSPIRATION	13.187	47868200.000	98.70
PERC./LEAKAGE THROUGH LAYER 19	0.120291	436657.187	0.90
CHANGE IN WATER STORAGE	0.026	93386.539	0.19
SOIL WATER AT START OF YEAR	500.115	*************	
SOIL WATER AT END OF YEAR	500.140	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	98.121	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 25

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.742	1.740

	0.450	0.049	0.160	1.579	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0095	0.0119	0.0101	0.0097	0.0086	0.0084
	0.0082	0.0056	0.0005	0.0000	0.0000	0.0048

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ANNUAL TOTALS FOR YEAR 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98480.594	0.20
EVAPOTRANSPIRATION	13.190	47880320.000	98.73
PERC./LEAKAGE THROUGH LAYER 19	0.077200	280235.156	0.58
CHANGE IN WATER STORAGE	0.066	237842.109	0.49
SOIL WATER AT START OF YEAR	500.140	*************	
SOIL WATER AT END OF YEAR	500.206	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-59.933	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 26

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.705	1.257	2.743	1.740

	0.451	0.049	0.160	1.578	0.703	0.229
PERCOLATION/LEAKAGE THROUGH	0.0073	0.0131	0.0167	0.0171	0.0145	0.0132
LAYER 19	0.0128	0.0087	0.0022	0.0000	0.0022	0.0090

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ANNUAL TOTALS FOR YEAR 26

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98314.992	0.20
EVAPOTRANSPIRATION	13.189	47875868.000	98.72
PERC./LEAKAGE THROUGH LAYER 19	0.116703	423633.625	0.87
CHANGE IN WATER STORAGE	0.027	99036.258	0.20
SOIL WATER AT START OF YEAR	500.206	*************	
SOIL WATER AT END OF YEAR	500.233	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-35.051	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 27

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.906	1.257	2.681	1.739

	0.450	0.049	0.160	1.580	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0097	0.0133	0.0169	0.0169	0.0156	0.0126
	0.0085	0.0073	0.0046	0.0023	0.0011	0.0025

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ANNUAL TOTALS FOR YEAR 27

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97271.336	0.20
EVAPOTRANSPIRATION	13.328	48380608.000	99.76
PERC./LEAKAGE THROUGH LAYER 19	0.111256	403859.531	0.83
CHANGE IN WATER STORAGE	-0.106	-384845.594	-0.79
SOIL WATER AT START OF YEAR	500.233	*************	
SOIL WATER AT END OF YEAR	500.127	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-74.862	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 28

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.796	2.735	1.230	2.727	1.740

	0.472	0.028	0.165	1.597	0.692	0.217
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0075	0.0146	0.0147	0.0122	0.0131	0.0125
	0.0125	0.0108	0.0103	0.0103	0.0078	0.0034

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ANNUAL TOTALS FOR YEAR 28

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98394.633	0.20
EVAPOTRANSPIRATION	13.189	47874440.000	98.72
PERC./LEAKAGE THROUGH LAYER 19	0.129735	470939.437	0.97
CHANGE IN WATER STORAGE	0.015	52952.270	0.11
SOIL WATER AT START OF YEAR	500.127	*************	
SOIL WATER AT END OF YEAR	500.142	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	93.253	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 29

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.006	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.706	1.257	2.742	1.740

	0.451	0.049	0.161	1.578	0.703	0.229
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0009	0.0014	0.0023	0.0039	0.0109
LAYER 19	0.0141	0.0187	0.0153	0.0127	0.0100	0.0108

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ANNUAL TOTALS FOR YEAR 29

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	98198.789	0.20
EVAPOTRANSPIRATION	13.189	47877068.000	98.72
PERC./LEAKAGE THROUGH LAYER 19	0.101062	366854.812	0.76
CHANGE IN WATER STORAGE	0.043	154536.437	0.32
SOIL WATER AT START OF YEAR	500.142	*************	
SOIL WATER AT END OF YEAR	500.184	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	162.003	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION	0.789	0.784	2.905	1.257	2.682	1.740

	0.450	0.049	0.160	1.580	0.704	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.0082	0.0073	0.0094	0.0113	0.0113	0.0088
	0.0078	0.0065	0.0037	0.0000	0.0000	0.0007

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ANNUAL TOTALS FOR YEAR 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	0.027	97307.227	0.20
EVAPOTRANSPIRATION	13.330	48388500.000	99.78
PERC./LEAKAGE THROUGH LAYER 19	0.074946	272052.281	0.56
CHANGE IN WATER STORAGE	-0.072	-260884.094	-0.54
SOIL WATER AT START OF YEAR	500.184	*************	
SOIL WATER AT END OF YEAR	500.112	*************	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-154.512	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00

RUNOFF

TOTALS	0.004	0.001	0.005	0.000	0.000	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.787	0.786	2.790	1.251	2.714	1.740
	0.455	0.044	0.161	1.584	0.701	0.227
STD. DEVIATIONS	0.007	0.006	0.101	0.012	0.031	0.001
	0.009	0.009	0.002	0.008	0.005	0.005

PERCOLATION/LEAKAGE THROUGH LAYER 19

TOTALS	0.0039	0.0046	0.0059	0.0074	0.0085	0.0086
	0.0093	0.0089	0.0071	0.0063	0.0052	0.0045
STD. DEVIATIONS	0.0039	0.0046	0.0048	0.0047	0.0046	0.0044
	0.0049	0.0051	0.0045	0.0045	0.0041	0.0037

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	13.36	(0.000)	48496828.0	100.00
RUNOFF	0.027	(0.0003)	98185.27	0.202
EVAPOTRANSPIRATION	13.240	(0.0682)	48059568.00	99.098
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.08009	(0.03336)	290719.469	0.59946
CHANGE IN WATER STORAGE	0.013	(0.0684)	48329.10	0.100

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	1.10	3993000.000
RUNOFF	0.016	59677.7617
PERCOLATION/LEAKAGE THROUGH LAYER 19	0.000845	3068.89160
SNOW WATER	0.79	2858422.7500
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.3192
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1360

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.4723	0.2060
2	52.5599	0.2920
3	2.9280	0.2440
4	52.5600	0.2920
5	2.9280	0.2440
6	52.5600	0.2920
7	2.9280	0.2440
8	52.5600	0.2920
9	3.0317	0.2526
10	52.5600	0.2920
11	2.9467	0.2456
12	52.5600	0.2920
13	2.9566	0.2464
14	52.5600	0.2920
15	2.9964	0.2497
16	52.5600	0.2920
17	2.9859	0.2488
18	52.5600	0.2920
19	0.8989	0.0375
SNOW WATER	0.000	

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LEACHATE COLLECTION MODELING
CLOSED CELL CASE

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**               HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                 **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     x:\shire\help\proprecp.D4
TEMPERATURE DATA FILE:       x:\shire\help\protemp.D7
SOLAR RADIATION DATA FILE:   x:\shire\help\prosolar.D13
EVAPOTRANSPIRATION DATA:     x:\shire\help\evapo12.D11
SOIL AND DESIGN DATA FILE:   x:\shire\help\cover.D10
OUTPUT DATA FILE:            x:\shire\help\cover.OUT


TIME:  13:36     DATE:   8/ 6/2003


******************************************************************************

     TITLE:  Closed Cell Case

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
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                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =     18.00   INCHES
          POROSITY                     =      0.5010 VOL/VOL
          FIELD CAPACITY               =      0.2840 VOL/VOL
          WILTING POINT                =      0.1350 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.2096 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
```

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 34

```
THICKNESS                   =      0.23    INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   33.0000000000     CM/SEC
SLOPE                       =     33.00    PERCENT
DRAINAGE LENGTH             =   1250.0     FEET
```

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 0

```
THICKNESS                   =      0.23    INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY         =      1.00    HOLES/ACRE
FML INSTALLATION DEFECTS    =      3.00    HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD
```

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

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THICKNESS                   =      0.23    INCHES
POROSITY                    =      0.7500 VOL/VOL
FIELD CAPACITY              =      0.7470 VOL/VOL
WILTING POINT               =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.300000003000E-08 CM/SEC
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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.068	0.000	0.569	0.000	0.051	0.000
	0.000	0.000	0.000	0.674	0.000	0.000
EVAPOTRANSPIRATION	0.658	0.732	2.477	1.172	2.306	1.740
	0.458	0.042	0.176	1.608	0.602	0.179
LATERAL DRAINAGE COLLECTED	0.0000	0.0029	0.0008	0.0000	0.0011	0.0000
FROM LAYER 2	0.0001	0.0000	0.0001	0.0001	0.0014	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.362	4943951.000	10.19
EVAPOTRANSPIRATION	12.151	44107872.000	90.95
DRAINAGE COLLECTED FROM LAYER 2	0.0064	23398.699	0.05
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.180	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	-0.159	-578424.625	-1.19
SOIL WATER AT START OF YEAR	3.948	14332992.000	
SOIL WATER AT END OF YEAR	3.789	13754567.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	23.916	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.070	0.000	0.561	0.000	0.036	0.000
	0.000	0.000	0.000	0.682	0.000	0.001
EVAPOTRANSPIRATION	0.526	0.798	2.414	0.973	2.497	1.738
	0.458	0.042	0.187	1.108	0.637	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0021	0.0006	0.0005	0.0028	0.0021
FROM LAYER 2	0.0000	0.0000	0.0001	0.0001	0.0024	0.0003
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.349	4897264.500	10.10
EVAPOTRANSPIRATION	11.511	41783432.000	86.16
DRAINAGE COLLECTED FROM LAYER 2	0.0109	39690.785	0.08
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.215	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.489	1776419.500	3.66
SOIL WATER AT START OF YEAR	3.789	13754567.000	
SOIL WATER AT END OF YEAR	4.279	15530986.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	11.087	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.087	0.000	0.550	0.000	0.030	0.000
	0.000	0.000	0.000	0.682	0.000	0.001
EVAPOTRANSPIRATION	0.473	1.232	2.396	1.146	2.443	1.739
	0.458	0.042	0.188	1.046	0.614	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0009	0.0045	0.0000	0.0071	0.0013
FROM LAYER 2	0.0000	0.0000	0.0000	0.0005	0.0026	0.0001

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.349	4897045.500	10.10
EVAPOTRANSPIRATION	11.910	43232728.000	89.15
DRAINAGE COLLECTED FROM LAYER 2	0.0172	62353.500	0.13
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.279	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.084	304669.406	0.63
SOIL WATER AT START OF YEAR	4.279	15530986.000	
SOIL WATER AT END OF YEAR	4.362	15835656.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	22.480	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.095	0.000	0.550	0.000	0.030	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.459	1.261	2.571	1.170	2.315	1.739
	0.473	0.026	0.191	1.085	0.581	0.131
LATERAL DRAINAGE COLLECTED	0.0000	0.0003	0.0023	0.0001	0.0000	0.0011
FROM LAYER 2	0.0013	0.0001	0.0000	0.0000	0.0006	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.301	4724062.500	9.74
EVAPOTRANSPIRATION	12.002	43566804.000	89.83
DRAINAGE COLLECTED FROM LAYER 2	0.0057	20553.799	0.04
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.144	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.051	185376.219	0.38
SOIL WATER AT START OF YEAR	4.362	15835656.000	
SOIL WATER AT END OF YEAR	4.414	16021032.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	21.058	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.186	2.548	1.220	2.406	1.739
	0.458	0.042	0.188	1.069	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0008	0.0032	0.0008	0.0000	0.0007
FROM LAYER 2	0.0000	0.0001	0.0000	0.0007	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757283.000	9.81
EVAPOTRANSPIRATION	12.044	43718024.000	90.15
DRAINAGE COLLECTED FROM LAYER 2	0.0064	23366.770	0.05
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.112	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	-0.001	-1883.240	0.00
SOIL WATER AT START OF YEAR	4.414	16021032.000	
SOIL WATER AT END OF YEAR	4.413	16019149.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	26.920	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.185	2.549	1.220	2.406	1.740
	0.458	0.042	0.188	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0012	0.0027	0.0008	0.0003	0.0002
FROM LAYER 2	0.0001	0.0001	0.0001	0.0000	0.0001	0.0003

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756192.500	9.81
EVAPOTRANSPIRATION	12.044	43718336.000	90.15
DRAINAGE COLLECTED FROM LAYER 2	0.0060	21805.037	0.04
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.110	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	453.501	0.00
SOIL WATER AT START OF YEAR	4.413	16019149.000	
SOIL WATER AT END OF YEAR	4.413	16019602.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	30.827	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.185	2.551	1.221	2.402	1.738
	0.458	0.042	0.187	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0010	0.0006	0.0003	0.0033	0.0021
FROM LAYER 2	0.0000	0.0000	0.0001	0.0003	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757306.500	9.81
EVAPOTRANSPIRATION	12.042	43711396.000	90.13
DRAINAGE COLLECTED FROM LAYER 2	0.0079	28533.217	0.06
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.126	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.000	-451.770	0.00
SOIL WATER AT START OF YEAR	4.413	16019602.000	
SOIL WATER AT END OF YEAR	4.413	16019151.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	35.040	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.225	2.610	1.133	2.389	1.740
	0.474	0.026	0.191	1.085	0.582	0.131
LATERAL DRAINAGE COLLECTED	0.0000	0.0012	0.0020	0.0008	0.0031	0.0003
FROM LAYER 2	0.0000	0.0001	0.0001	0.0001	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756466.000	9.81
EVAPOTRANSPIRATION	12.041	43709968.000	90.13
DRAINAGE COLLECTED FROM LAYER 2	0.0079	28568.770	0.06
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.126	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	1791.501	0.00
SOIL WATER AT START OF YEAR	4.413	16019151.000	
SOIL WATER AT END OF YEAR	4.413	16020942.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	26.318	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.186	2.550	1.220	2.406	1.740
	0.458	0.042	0.188	1.070	0.599	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0009	0.0019	0.0003	0.0002	0.0004
FROM LAYER 2	0.0000	0.0000	0.0000	0.0000	0.0013	0.0001

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756205.500	9.81
EVAPOTRANSPIRATION	12.045	43724816.000	90.16
DRAINAGE COLLECTED FROM LAYER 2	0.0052	18842.871	0.04
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.118	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	-0.001	-3058.534	-0.01
SOIL WATER AT START OF YEAR	4.413	16020942.000	
SOIL WATER AT END OF YEAR	4.413	16017884.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	14.939	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.455	1.186	2.550	1.220	2.403	1.739
	0.458	0.042	0.187	1.069	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0001	0.0008	0.0011	0.0009	0.0026	0.0007
FROM LAYER 2	0.0005	0.0000	0.0002	0.0005	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757280.500	9.81
EVAPOTRANSPIRATION	12.042	43711488.000	90.13
DRAINAGE COLLECTED FROM LAYER 2	0.0074	26758.070	0.06
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.123	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.000	1263.571	0.00
SOIL WATER AT START OF YEAR	4.413	16017884.000	
SOIL WATER AT END OF YEAR	4.413	16019147.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	30.805	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 11

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.185	2.549	1.220	2.404	1.740
	0.458	0.042	0.187	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0009	0.0029	0.0003	0.0024	0.0000
FROM LAYER 2	0.0002	0.0000	0.0001	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756445.000	9.81
EVAPOTRANSPIRATION	12.042	43713196.000	90.14
DRAINAGE COLLECTED FROM LAYER 2	0.0070	25364.633	0.05
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.119	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	1791.501	0.00
SOIL WATER AT START OF YEAR	4.413	16019147.000	
SOIL WATER AT END OF YEAR	4.413	16020939.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	21.336	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 12

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.225	2.611	1.133	2.390	1.739
	0.474	0.026	0.191	1.085	0.582	0.131
LATERAL DRAINAGE COLLECTED	0.0000	0.0010	0.0016	0.0008	0.0026	0.0007
FROM LAYER 2	0.0001	0.0000	0.0000	0.0003	0.0000	0.0003

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757274.500	9.81
EVAPOTRANSPIRATION	12.043	43715592.000	90.14
DRAINAGE COLLECTED FROM LAYER 2	0.0074	26869.625	0.06
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.129	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	-0.001	-2952.948	-0.01
SOIL WATER AT START OF YEAR	4.413	16020939.000	
SOIL WATER AT END OF YEAR	4.413	16017986.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	36.082	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 13

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.030	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.455	1.185	2.549	1.220	2.400	1.740
	0.458	0.042	0.187	1.069	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0010	0.0023	0.0003	0.0059	0.0001
FROM LAYER 2	0.0000	0.0001	0.0001	0.0011	0.0004	0.0004
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757982.500	9.81
EVAPOTRANSPIRATION	12.038	43696240.000	90.10
DRAINAGE COLLECTED FROM LAYER 2	0.0117	42626.664	0.09
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.177	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.000	-64.044	0.00
SOIL WATER AT START OF YEAR	4.413	16017986.000	
SOIL WATER AT END OF YEAR	4.413	16017922.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	33.387	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 14

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.455	1.186	2.551	1.219	2.403	1.740
	0.458	0.042	0.187	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0008	0.0001	0.0015	0.0032	0.0001
FROM LAYER 2	0.0003	0.0000	0.0001	0.0002	0.0003	0.0003
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757291.000	9.81
EVAPOTRANSPIRATION	12.043	43714708.000	90.14
DRAINAGE COLLECTED FROM LAYER 2	0.0068	24842.320	0.05
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.133	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	-31.157	0.00
SOIL WATER AT START OF YEAR	4.413	16017922.000	
SOIL WATER AT END OF YEAR	4.413	16017890.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	11.378	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.455	1.185	2.549	1.220	2.406	1.736
	0.458	0.042	0.187	1.070	0.599	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0012	0.0021	0.0008	0.0007	0.0036
FROM LAYER 2	0.0000	0.0000	0.0002	0.0000	0.0006	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756185.500	9.81
EVAPOTRANSPIRATION	12.040	43704576.000	90.12
DRAINAGE COLLECTED FROM LAYER 2	0.0092	33334.941	0.07
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.146	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.001	2712.350	0.01
SOIL WATER AT START OF YEAR	4.413	16017890.000	
SOIL WATER AT END OF YEAR	4.413	16020603.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	9.766	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 16

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.225	2.610	1.133	2.392	1.740
	0.474	0.026	0.191	1.085	0.582	0.131
LATERAL DRAINAGE COLLECTED	0.0000	0.0009	0.0020	0.0004	0.0005	0.0004
FROM LAYER 2	0.0000	0.0001	0.0001	0.0002	0.0006	0.0003
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756258.000	9.81
EVAPOTRANSPIRATION	12.045	43721580.000	90.15
DRAINAGE COLLECTED FROM LAYER 2	0.0055	20125.250	0.04
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.094	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.000	-1164.908	0.00
SOIL WATER AT START OF YEAR	4.413	16020603.000	
SOIL WATER AT END OF YEAR	4.413	16019438.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	19.956	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 17

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.030	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.186	2.549	1.220	2.399	1.740
	0.458	0.042	0.188	1.070	0.599	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0009	0.0019	0.0003	0.0070	0.0005
FROM LAYER 2	0.0001	0.0000	0.0000	0.0000	0.0006	0.0003
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757936.500	9.81
EVAPOTRANSPIRATION	12.038	43696524.000	90.10
DRAINAGE COLLECTED FROM LAYER 2	0.0116	42134.465	0.09
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.164	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	199.056	0.00
SOIL WATER AT START OF YEAR	4.413	16019438.000	
SOIL WATER AT END OF YEAR	4.413	16019637.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	24.931	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 18

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.186	2.548	1.220	2.406	1.739
	0.458	0.042	0.188	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0008	0.0031	0.0003	0.0002	0.0005
FROM LAYER 2	0.0003	0.0001	0.0000	0.0000	0.0001	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756191.000	9.81
EVAPOTRANSPIRATION	12.044	43721048.000	90.15
DRAINAGE COLLECTED FROM LAYER 2	0.0055	20066.984	0.04
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.091	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	-510.621	0.00
SOIL WATER AT START OF YEAR	4.413	16019637.000	
SOIL WATER AT END OF YEAR	4.413	16019126.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	24.134	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 19

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.455	1.186	2.547	1.220	2.404	1.739
	0.458	0.042	0.188	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0001	0.0009	0.0046	0.0006	0.0014	0.0013
FROM LAYER 2	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757282.500	9.81
EVAPOTRANSPIRATION	12.040	43705496.000	90.12
DRAINAGE COLLECTED FROM LAYER 2	0.0090	32522.857	0.07
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.136	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.000	1495.514	0.00
SOIL WATER AT START OF YEAR	4.413	16019126.000	
SOIL WATER AT END OF YEAR	4.413	16020622.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	24.341	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.226	2.610	1.133	2.390	1.740
	0.474	0.026	0.191	1.085	0.582	0.131
LATERAL DRAINAGE COLLECTED	0.0000	0.0008	0.0023	0.0003	0.0024	0.0003
FROM LAYER 2	0.0000	0.0001	0.0000	0.0004	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756409.000	9.81
EVAPOTRANSPIRATION	12.043	43717576.000	90.15
DRAINAGE COLLECTED FROM LAYER 2	0.0067	24298.156	0.05
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.119	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	-1492.052	0.00
SOIL WATER AT START OF YEAR	4.413	16020622.000	
SOIL WATER AT END OF YEAR	4.413	16019130.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	28.492	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 21

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.455	1.186	2.551	1.220	2.406	1.740
	0.457	0.042	0.188	1.070	0.599	0.132
LATERAL DRAINAGE COLLECTED	0.0003	0.0009	0.0008	0.0003	0.0004	0.0002
FROM LAYER 2	0.0014	0.0000	0.0000	0.0002	0.0006	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 21

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756189.000	9.81
EVAPOTRANSPIRATION	12.044	43720904.000	90.15
DRAINAGE COLLECTED FROM LAYER 2	0.0050	18242.756	0.04
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.108	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	1471.281	0.00
SOIL WATER AT START OF YEAR	4.413	16019130.000	
SOIL WATER AT END OF YEAR	4.413	16020601.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	13.570	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 22

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.186	2.547	1.220	2.406	1.740
	0.458	0.042	0.188	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0009	0.0043	0.0008	0.0000	0.0001
FROM LAYER 2	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 22

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757280.500	9.81
EVAPOTRANSPIRATION	12.043	43716432.000	90.14
DRAINAGE COLLECTED FROM LAYER 2	0.0064	23082.977	0.05
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.120	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.000	17.309	0.00
SOIL WATER AT START OF YEAR	4.413	16020601.000	
SOIL WATER AT END OF YEAR	4.413	16020618.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	5.198	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 23

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.185	2.550	1.220	2.405	1.737
	0.457	0.042	0.188	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0013	0.0013	0.0008	0.0019	0.0028
FROM LAYER 2	0.0007	0.0001	0.0000	0.0005	0.0004	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 23

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756250.500	9.81
EVAPOTRANSPIRATION	12.041	43707256.000	90.12
DRAINAGE COLLECTED FROM LAYER 2	0.0097	35259.078	0.07
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.137	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	-0.001	-1968.055	0.00
SOIL WATER AT START OF YEAR	4.413	16020618.000	
SOIL WATER AT END OF YEAR	4.413	16018650.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	21.672	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 24

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.455	1.226	2.611	1.133	2.392	1.739
	0.474	0.026	0.191	1.085	0.582	0.131
LATERAL DRAINAGE COLLECTED	0.0001	0.0008	0.0016	0.0008	0.0006	0.0012
FROM LAYER 2	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 24

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756186.000	9.81
EVAPOTRANSPIRATION	12.044	43719648.000	90.15
DRAINAGE COLLECTED FROM LAYER 2	0.0055	20005.838	0.04
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.108	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	957.198	0.00
SOIL WATER AT START OF YEAR	4.413	16018650.000	
SOIL WATER AT END OF YEAR	4.413	16019608.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	20.787	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 25

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.186	2.545	1.220	2.406	1.739
	0.458	0.042	0.188	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0009	0.0033	0.0039	0.0000	0.0012
FROM LAYER 2	0.0000	0.0003	0.0000	0.0000	0.0000	0.0004
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757300.500	9.81
EVAPOTRANSPIRATION	12.039	43702812.000	90.11
DRAINAGE COLLECTED FROM LAYER 2	0.0101	36677.852	0.08
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.144	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.000	20.771	0.00
SOIL WATER AT START OF YEAR	4.413	16019608.000	
SOIL WATER AT END OF YEAR	4.413	16019628.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	8.831	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 26

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.030	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.185	2.548	1.220	2.402	1.739
	0.458	0.042	0.187	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0012	0.0031	0.0006	0.0038	0.0012
FROM LAYER 2	0.0001	0.0001	0.0001	0.0001	0.0002	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 26

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757484.500	9.81
EVAPOTRANSPIRATION	12.039	43702124.000	90.11
DRAINAGE COLLECTED FROM LAYER 2	0.0104	37902.055	0.08
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.147	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	-732.179	0.00
SOIL WATER AT START OF YEAR	4.413	16019628.000	
SOIL WATER AT END OF YEAR	4.413	16018896.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	39.106	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 27

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.455	1.185	2.548	1.220	2.406	1.740
	0.458	0.042	0.188	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0012	0.0035	0.0008	0.0001	0.0002
FROM LAYER 2	0.0005	0.0000	0.0001	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 27

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756191.500	9.81
EVAPOTRANSPIRATION	12.043	43715412.000	90.14
DRAINAGE COLLECTED FROM LAYER 2	0.0065	23490.195	0.05
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.113	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	1704.955	0.00
SOIL WATER AT START OF YEAR	4.413	16018896.000	
SOIL WATER AT END OF YEAR	4.413	16020601.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	20.330	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 28

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.225	2.609	1.133	2.391	1.739
	0.474	0.026	0.191	1.085	0.582	0.131
LATERAL DRAINAGE COLLECTED	0.0000	0.0009	0.0032	0.0008	0.0014	0.0011
FROM LAYER 2	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 28

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756200.500	9.81
EVAPOTRANSPIRATION	12.042	43712924.000	90.14
DRAINAGE COLLECTED FROM LAYER 2	0.0075	27346.297	0.06
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.132	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		

CHANGE IN WATER STORAGE	0.000	339.260	0.00
SOIL WATER AT START OF YEAR	4.413	16020601.000	
SOIL WATER AT END OF YEAR	4.413	16020940.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	10.311	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 29

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.186	2.549	1.219	2.404	1.739
	0.458	0.042	0.188	1.070	0.600	0.132
LATERAL DRAINAGE COLLECTED	0.0000	0.0008	0.0028	0.0014	0.0015	0.0008
FROM LAYER 2	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 29

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.311	4757297.500	9.81
EVAPOTRANSPIRATION	12.043	43714744.000	90.14
DRAINAGE COLLECTED FROM LAYER 2	0.0073	26551.115	0.05
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.129	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	-1794.963	0.00
SOIL WATER AT START OF YEAR	4.413	16020940.000	
SOIL WATER AT END OF YEAR	4.413	16019145.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	21.389	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.101	0.000	0.554	0.000	0.029	0.000
	0.000	0.000	0.000	0.625	0.000	0.001
EVAPOTRANSPIRATION	0.456	1.185	2.549	1.220	2.406	1.740
	0.458	0.042	0.188	1.069	0.600	0.132
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0000	0.0013	0.0021	0.0008	0.0005	0.0003
	0.0000	0.0001	0.0000	0.0007	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	48496820.000	100.00
RUNOFF	1.310	4756208.000	9.81
EVAPOTRANSPIRATION	12.044	43717948.000	90.15
DRAINAGE COLLECTED FROM LAYER 2	0.0057	20855.004	0.04
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.087	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
CHANGE IN WATER STORAGE	0.000	1798.425	0.00
SOIL WATER AT START OF YEAR	4.413	16019145.000	
SOIL WATER AT END OF YEAR	4.413	16020944.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	11.570	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.098	0.000	0.554	0.000	0.030	0.000
	0.000	0.000	0.000	0.631	0.000	0.001
STD. DEVIATIONS	0.008	0.000	0.003	0.000	0.004	0.000
	0.000	0.000	0.000	0.016	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.465	1.169	2.550	1.189	2.400	1.739
	0.462	0.038	0.188	1.092	0.597	0.133
STD. DEVIATIONS	0.039	0.112	0.049	0.055	0.031	0.001
	0.007	0.007	0.003	0.098	0.011	0.009
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.0000	0.0010	0.0023	0.0007	0.0019	0.0008
	0.0002	0.0001	0.0001	0.0002	0.0004	0.0001
STD. DEVIATIONS	0.0001	0.0005	0.0012	0.0007	0.0020	0.0008
	0.0004	0.0001	0.0000	0.0003	0.0007	0.0002
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3						
AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36 (0.000)	48496828.0	100.00
RUNOFF	1.314 (0.0135)	4771297.00	9.838
EVAPOTRANSPIRATION	12.022 (0.1021)	43640720.00	89.987
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.00786 (0.00263)	28515.686	0.05880
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000 (0.00000)	0.136	0.00000
AVERAGE HEAD ON TOP OF LAYER 3	0.000 (0.000)		
CHANGE IN WATER STORAGE	0.016 (0.0960)	56265.08	0.116

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	1.10	3993000.000
RUNOFF	0.682	2475487.0000
DRAINAGE COLLECTED FROM LAYER 2	0.00069	2516.32080
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.03123
AVERAGE HEAD ON TOP OF LAYER 3	0.000	
MAXIMUM HEAD ON TOP OF LAYER 3	0.559	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.79	2858422.7500

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.2520

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1350

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	4.2387	0.2355
2	0.0023	0.0100
3	0.0000	0.0000
4	0.1725	0.7500
SNOW WATER	0.000	

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LEACHATE COLLECTION SYSTEM CALCULATIONS

Flow Through Leachate Collection Layer

From the puncture analysis the maximum aggregate size is 3/4"

If the coefficient of permeability (K) is
1 cm/sec or 1.97 ft/min

Using Darcy's Law

Q=kia

If i=0.05ft/ft which is equal to the minimum slope
If a=1 ft^2 for a minimum of 1 foot of head over the cover

Q=(1.97 ft/min)*(0.05 ft/ft)*(1 ft_2)
Q=0.0985 ft^3/min or 0.74 gal/min

EVAPORATION BASIN CALCULATIONS
HELP MODELING

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******************************************************************************
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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     x:\shire\help\proprecp.D4
TEMPERATURE DATA FILE:       x:\shire\help\protemp.D7
SOLAR RADIATION DATA FILE:   x:\shire\help\prosolar.D13
EVAPOTRANSPIRATION DATA:     x:\shire\help\evapo12.D11
SOIL AND DESIGN DATA FILE:   x:\shire\help\evapba.D10
OUTPUT DATA FILE:            x:\shire\help\evapbaot.OUT


TIME:  14:45     DATE:   8/ 6/2003


******************************************************************************

     TITLE:  Evaporation Basin

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   0
          THICKNESS                     =     12.00   INCHES
          POROSITY                      =      0.3980 VOL/VOL
          FIELD CAPACITY                =      0.2440 VOL/VOL
          WILTING POINT                 =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.2061 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	180.00 INCHES
POROSITY	=	0.6710 VOL/VOL
FIELD CAPACITY	=	0.2920 VOL/VOL
WILTING POINT	=	0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00 INCHES
POROSITY	=	0.3970 VOL/VOL
FIELD CAPACITY	=	0.0320 VOL/VOL
WILTING POINT	=	0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0330 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	1.00000000000 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	92.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	20.000	ACRES
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.473	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	4.776	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.632	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	55.825	INCHES
TOTAL INITIAL WATER	=	55.825	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SALT LAKE CITY UTAH

STATION LATITUDE	=	40.76 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.60
START OF GROWING SEASON (JULIAN DATE)	=	117
END OF GROWING SEASON (JULIAN DATE)	=	289
EVAPORATIVE ZONE DEPTH	=	12.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	48.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	39.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	65.00 %

NOTE: PRECIPITATION DATA FOR Bear River Refuge Utah
WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Salt Lake City Utah
WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Salt Lake City Utah
WAS ENTERED BY THE USER.

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.764	0.772	2.918	1.257	2.692	1.740
	0.451	0.049	0.159	1.586	0.703	0.229
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0081	0.0061	0.0053	0.0043	0.0006	0.0000
	0.0012	0.0028	0.0065	0.0069	0.0055	0.0044

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.322	967178.937	99.72
PERC./LEAKAGE THROUGH LAYER 3	0.051718	3754.724	0.39
CHANGE IN WATER STORAGE	-0.014	-997.840	-0.10
SOIL WATER AT START OF YEAR	55.825	4052894.250	
SOIL WATER AT END OF YEAR	55.811	4051896.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.540	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.762	0.773	2.815	1.257	2.730	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0002	0.0020	0.0026	0.0007	0.0000
LAYER 3	0.0017	0.0081	0.0104	0.0112	0.0105	0.0100

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.252	962131.187	99.20
PERC./LEAKAGE THROUGH LAYER 3	0.057568	4179.409	0.43
CHANGE IN WATER STORAGE	0.050	3626.067	0.37
SOIL WATER AT START OF YEAR	55.811	4051896.500	
SOIL WATER AT END OF YEAR	55.861	4055522.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.278	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.761	0.773	2.814	1.257	2.738	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0118	0.0094	0.0057	0.0053	0.0034	0.0001
LAYER 3	0.0067	0.0119	0.0126	0.0124	0.0111	0.0104

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.259	962590.375	99.24
PERC./LEAKAGE THROUGH LAYER 3	0.100925	7327.130	0.76
CHANGE IN WATER STORAGE	0.000	18.555	0.00
SOIL WATER AT START OF YEAR	55.861	4055522.500	
SOIL WATER AT END OF YEAR	55.861	4055541.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.334	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.796	2.741	1.230	2.723	1.740
	0.472	0.028	0.164	1.601	0.692	0.217
PERCOLATION/LEAKAGE THROUGH	0.0123	0.0095	0.0084	0.0064	0.0020	0.0027
LAYER 3	0.0201	0.0230	0.0197	0.0174	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.199	958224.437	98.79
PERC./LEAKAGE THROUGH LAYER 3	0.148864	10807.523	1.11
CHANGE IN WATER STORAGE	0.012	904.232	0.09
SOIL WATER AT START OF YEAR	55.861	4055541.000	
SOIL WATER AT END OF YEAR	55.874	4056445.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.196	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.762	0.773	2.814	1.257	2.734	1.740
	0.451	0.049	0.160	1.582	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0119	0.0078	0.0069	0.0039	0.0007
LAYER 3	0.0094	0.0140	0.0139	0.0133	0.0117	0.0108

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.255	962308.250	99.21
PERC./LEAKAGE THROUGH LAYER 3	0.115520	8386.717	0.86
CHANGE IN WATER STORAGE	-0.010	-759.112	-0.08
SOIL WATER AT START OF YEAR	55.874	4056445.250	
SOIL WATER AT END OF YEAR	55.863	4055686.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.554	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.739	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0124	0.0096	0.0086	0.0066	0.0022	0.0025
LAYER 3	0.0199	0.0230	0.0197	0.0174	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.200	958339.812	98.80
PERC./LEAKAGE THROUGH LAYER 3	0.149169	10829.702	1.12
CHANGE IN WATER STORAGE	0.011	766.312	0.08
SOIL WATER AT START OF YEAR	55.863	4055686.250	
SOIL WATER AT END OF YEAR	55.874	4056452.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.589	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.737	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0119	0.0106	0.0078	0.0027	0.0041
LAYER 3	0.0227	0.0243	0.0203	0.0177	0.0146	0.0129

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.199	958220.125	98.79
PERC./LEAKAGE THROUGH LAYER 3	0.160931	11683.605	1.20
CHANGE IN WATER STORAGE	0.000	32.126	0.00
SOIL WATER AT START OF YEAR	55.874	4056452.500	
SOIL WATER AT END OF YEAR	55.874	4056484.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.513	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.796	2.741	1.230	2.725	1.740
	0.472	0.028	0.164	1.601	0.692	0.217
PERCOLATION/LEAKAGE THROUGH	0.0113	0.0123	0.0106	0.0079	0.0024	0.0047
LAYER 3	0.0226	0.0238	0.0200	0.0175	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.201	958363.062	98.81
PERC./LEAKAGE THROUGH LAYER 3	0.160241	11633.533	1.20
CHANGE IN WATER STORAGE	-0.001	-60.651	-0.01
SOIL WATER AT START OF YEAR	55.874	4056484.500	
SOIL WATER AT END OF YEAR	55.874	4056424.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.458	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.762	0.773	2.814	1.257	2.738	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0119	0.0077	0.0069	0.0038	0.0007
LAYER 3	0.0090	0.0133	0.0133	0.0129	0.0114	0.0105

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.259	962621.187	99.25
PERC./LEAKAGE THROUGH LAYER 3	0.112651	8178.437	0.84
CHANGE IN WATER STORAGE	-0.012	-863.798	-0.09
SOIL WATER AT START OF YEAR	55.874	4056424.000	
SOIL WATER AT END OF YEAR	55.862	4055560.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.570	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.739	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0125	0.0093	0.0084	0.0065	0.0023	0.0022
LAYER 3	0.0194	0.0228	0.0197	0.0174	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.200	958324.000	98.80
PERC./LEAKAGE THROUGH LAYER 3	0.147571	10713.625	1.10
CHANGE IN WATER STORAGE	0.012	898.139	0.09
SOIL WATER AT START OF YEAR	55.862	4055560.000	
SOIL WATER AT END OF YEAR	55.874	4056458.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.624	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 11

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.739	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0119	0.0106	0.0079	0.0026	0.0041
LAYER 3	0.0223	0.0239	0.0201	0.0176	0.0145	0.0128

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.201	958364.187	98.81
PERC./LEAKAGE THROUGH LAYER 3	0.159476	11577.944	1.19
CHANGE IN WATER STORAGE	0.000	-6.370	0.00
SOIL WATER AT START OF YEAR	55.874	4056458.250	
SOIL WATER AT END OF YEAR	55.874	4056452.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.657	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 12

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.796	2.741	1.230	2.726	1.740
	0.472	0.028	0.164	1.601	0.692	0.217
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0123	0.0105	0.0078	0.0022	0.0046
LAYER 3	0.0224	0.0237	0.0199	0.0174	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.201	958402.187	98.81
PERC./LEAKAGE THROUGH LAYER 3	0.159173	11555.960	1.19
CHANGE IN WATER STORAGE	0.000	-22.156	0.00
SOIL WATER AT START OF YEAR	55.874	4056452.000	
SOIL WATER AT END OF YEAR	55.874	4056429.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.417	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 13

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.712	1.257	2.738	1.740
	0.451	0.049	0.160	1.582	0.703	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0120	0.0104	0.0074	0.0026	0.0042
LAYER 3	0.0225	0.0240	0.0202	0.0176	0.0145	0.0129

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.200	958299.562	98.80
PERC./LEAKAGE THROUGH LAYER 3	0.159663	11591.533	1.20
CHANGE IN WATER STORAGE	0.001	44.312	0.00
SOIL WATER AT START OF YEAR	55.874	4056429.750	
SOIL WATER AT END OF YEAR	55.874	4056474.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.984	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 14

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.738	1.740
	0.451	0.049	0.160	1.583	0.703	0.229
PERCOLATION/LEAKAGE THROUGH	0.0113	0.0118	0.0107	0.0079	0.0027	0.0041
LAYER 3	0.0225	0.0241	0.0202	0.0176	0.0145	0.0129

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.200	958308.437	98.80
PERC./LEAKAGE THROUGH LAYER 3	0.160397	11644.796	1.20
CHANGE IN WATER STORAGE	0.000	-16.894	0.00
SOIL WATER AT START OF YEAR	55.874	4056474.000	
SOIL WATER AT END OF YEAR	55.874	4056457.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.065	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.761	0.773	2.814	1.257	2.739	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0113	0.0119	0.0089	0.0075	0.0035	0.0003
LAYER 3	0.0080	0.0129	0.0132	0.0128	0.0114	0.0106

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.260	962645.625	99.25
PERC./LEAKAGE THROUGH LAYER 3	0.112342	8156.010	0.84
CHANGE IN WATER STORAGE	-0.012	-865.736	-0.09
SOIL WATER AT START OF YEAR	55.874	4056457.250	
SOIL WATER AT END OF YEAR	55.862	4055591.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.495	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 16

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.761	0.784	2.844	1.230	2.714	1.740
	0.472	0.028	0.164	1.601	0.692	0.217
PERCOLATION/LEAKAGE THROUGH	0.0124	0.0096	0.0055	0.0057	0.0032	0.0003
LAYER 3	0.0081	0.0138	0.0140	0.0135	0.0119	0.0110

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.248	961818.125	99.16
PERC./LEAKAGE THROUGH LAYER 3	0.108908	7906.748	0.82
CHANGE IN WATER STORAGE	0.003	211.588	0.02
SOIL WATER AT START OF YEAR	55.862	4055591.500	
SOIL WATER AT END OF YEAR	55.865	4055803.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.049	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 17

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.712	1.257	2.739	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0121	0.0100	0.0089	0.0068	0.0023	0.0026
LAYER 3	0.0200	0.0229	0.0197	0.0173	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.202	958441.000	98.81
PERC./LEAKAGE THROUGH LAYER 3	0.149834	10877.965	1.12
CHANGE IN WATER STORAGE	0.008	616.484	0.06
SOIL WATER AT START OF YEAR	55.865	4055803.000	
SOIL WATER AT END OF YEAR	55.874	4056419.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.929	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 18

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.761	0.773	2.814	1.257	2.739	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0119	0.0077	0.0069	0.0038	0.0007
LAYER 3	0.0089	0.0132	0.0132	0.0128	0.0113	0.0105

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.260	962671.312	99.25
PERC./LEAKAGE THROUGH LAYER 3	0.112215	8146.799	0.84
CHANGE IN WATER STORAGE	-0.012	-882.076	-0.09
SOIL WATER AT START OF YEAR	55.874	4056419.500	
SOIL WATER AT END OF YEAR	55.861	4055537.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.359	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 19

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.737	1.740
	0.451	0.049	0.160	1.583	0.703	0.229
PERCOLATION/LEAKAGE THROUGH	0.0126	0.0092	0.0083	0.0063	0.0022	0.0024
LAYER 3	0.0196	0.0231	0.0199	0.0175	0.0145	0.0129

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.198	958190.375	98.79
PERC./LEAKAGE THROUGH LAYER 3	0.148508	10781.694	1.11
CHANGE IN WATER STORAGE	0.013	964.053	0.10
SOIL WATER AT START OF YEAR	55.861	4055537.500	
SOIL WATER AT END OF YEAR	55.875	4056501.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.268	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.796	2.741	1.230	2.725	1.740
	0.472	0.028	0.164	1.601	0.692	0.217
PERCOLATION/LEAKAGE THROUGH	0.0113	0.0122	0.0106	0.0079	0.0024	0.0047
LAYER 3	0.0227	0.0239	0.0200	0.0175	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.201	958370.812	98.81
PERC./LEAKAGE THROUGH LAYER 3	0.160375	11643.197	1.20
CHANGE IN WATER STORAGE	-0.001	-78.099	-0.01
SOIL WATER AT START OF YEAR	55.875	4056501.500	
SOIL WATER AT END OF YEAR	55.874	4056423.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.487	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 21

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.762	0.773	2.814	1.257	2.737	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0119	0.0077	0.0069	0.0039	0.0007
LAYER 3	0.0089	0.0134	0.0134	0.0130	0.0115	0.0106

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ANNUAL TOTALS FOR YEAR 21

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.258	962538.500	99.24
PERC./LEAKAGE THROUGH LAYER 3	0.113288	8224.722	0.85
CHANGE IN WATER STORAGE	-0.011	-826.964	-0.09
SOIL WATER AT START OF YEAR	55.874	4056423.250	
SOIL WATER AT END OF YEAR	55.862	4055596.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.121	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 22

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.739	1.740
	0.451	0.049	0.160	1.582	0.703	0.229
PERCOLATION/LEAKAGE THROUGH	0.0125	0.0094	0.0085	0.0064	0.0022	0.0025
LAYER 3	0.0197	0.0229	0.0197	0.0174	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 22

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.200	958294.312	98.80
PERC./LEAKAGE THROUGH LAYER 3	0.148256	10763.382	1.11
CHANGE IN WATER STORAGE	0.012	878.476	0.09
SOIL WATER AT START OF YEAR	55.862	4055596.500	
SOIL WATER AT END OF YEAR	55.874	4056474.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.234	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 23

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.727	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0118	0.0085	0.0088	0.0031	0.0060
LAYER 3	0.0264	0.0262	0.0214	0.0183	0.0150	0.0132

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ANNUAL TOTALS FOR YEAR 23

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.189	957525.000	98.72
PERC./LEAKAGE THROUGH LAYER 3	0.169945	12338.031	1.27
CHANGE IN WATER STORAGE	0.001	72.837	0.01
SOIL WATER AT START OF YEAR	55.874	4056474.750	
SOIL WATER AT END OF YEAR	55.875	4056547.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.513	0.00

MONTHLY TOTALS (IN INCHES) FOR YEAR 24

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.761	0.784	2.844	1.230	2.723	1.740
	0.472	0.028	0.164	1.602	0.692	0.217
PERCOLATION/LEAKAGE THROUGH	0.0115	0.0122	0.0080	0.0073	0.0037	0.0009
LAYER 3	0.0095	0.0136	0.0135	0.0130	0.0114	0.0106

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ANNUAL TOTALS FOR YEAR 24

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.259	962580.312	99.24
PERC./LEAKAGE THROUGH LAYER 3	0.115231	8365.775	0.86
CHANGE IN WATER STORAGE	-0.014	-1010.303	-0.10
SOIL WATER AT START OF YEAR	55.875	4056547.750	
SOIL WATER AT END OF YEAR	55.861	4055537.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.587	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 25

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.762	0.773	2.815	1.257	2.738	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0126	0.0092	0.0056	0.0056	0.0032	0.0001
LAYER 3	0.0064	0.0116	0.0123	0.0123	0.0110	0.0103

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ANNUAL TOTALS FOR YEAR 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.260	962697.000	99.25
PERC./LEAKAGE THROUGH LAYER 3	0.100357	7285.917	0.75
CHANGE IN WATER STORAGE	-0.001	-47.358	0.00
SOIL WATER AT START OF YEAR	55.861	4055537.500	
SOIL WATER AT END OF YEAR	55.861	4055490.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.836	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 26

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.761	0.773	2.814	1.257	2.689	1.740
	0.451	0.049	0.160	1.582	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0124	0.0091	0.0054	0.0051	0.0039	0.0005
LAYER 3	0.0154	0.0213	0.0191	0.0172	0.0143	0.0128

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ANNUAL TOTALS FOR YEAR 26

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.210	959018.187	98.87
PERC./LEAKAGE THROUGH LAYER 3	0.136614	9918.177	1.02
CHANGE IN WATER STORAGE	0.014	999.502	0.10
SOIL WATER AT START OF YEAR	55.861	4055490.000	
SOIL WATER AT END OF YEAR	55.875	4056489.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.542	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 27

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.739	1.740
	0.451	0.049	0.160	1.582	0.703	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0118	0.0107	0.0078	0.0026	0.0043
LAYER 3	0.0226	0.0241	0.0202	0.0176	0.0145	0.0129

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ANNUAL TOTALS FOR YEAR 27

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.200	958306.375	98.80
PERC./LEAKAGE THROUGH LAYER 3	0.160351	11641.509	1.20
CHANGE IN WATER STORAGE	0.000	-11.632	0.00
SOIL WATER AT START OF YEAR	55.875	4056489.500	
SOIL WATER AT END OF YEAR	55.874	4056478.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.167	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 28

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.796	2.741	1.230	2.725	1.740
	0.472	0.028	0.164	1.601	0.692	0.217
PERCOLATION/LEAKAGE THROUGH	0.0113	0.0122	0.0075	0.0082	0.0029	0.0062
LAYER 3	0.0235	0.0241	0.0201	0.0175	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 28

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.200	958349.812	98.81
PERC./LEAKAGE THROUGH LAYER 3	0.160532	11654.607	1.20
CHANGE IN WATER STORAGE	-0.001	-68.406	-0.01
SOIL WATER AT START OF YEAR	55.874	4056478.000	
SOIL WATER AT END OF YEAR	55.873	4056409.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.361	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 29

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.762	0.773	2.814	1.257	2.739	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0112	0.0120	0.0077	0.0069	0.0037	0.0007
LAYER 3	0.0088	0.0131	0.0131	0.0127	0.0113	0.0104

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ANNUAL TOTALS FOR YEAR 29

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.261	962724.500	99.26
PERC./LEAKAGE THROUGH LAYER 3	0.111590	8101.455	0.84
CHANGE IN WATER STORAGE	-0.012	-889.554	-0.09
SOIL WATER AT START OF YEAR	55.873	4056409.500	
SOIL WATER AT END OF YEAR	55.861	4055520.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.008	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.793	0.785	2.711	1.257	2.739	1.740
	0.451	0.049	0.160	1.583	0.704	0.229
PERCOLATION/LEAKAGE THROUGH	0.0125	0.0092	0.0083	0.0064	0.0022	0.0022
LAYER 3	0.0193	0.0227	0.0196	0.0173	0.0144	0.0128

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ANNUAL TOTALS FOR YEAR 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.36	969936.375	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.200	958340.812	98.80
PERC./LEAKAGE THROUGH LAYER 3	0.146918	10666.261	1.10
CHANGE IN WATER STORAGE	0.013	928.603	0.10
SOIL WATER AT START OF YEAR	55.861	4055520.000	
SOIL WATER AT END OF YEAR	55.874	4056448.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.700	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.92	0.78	3.09	1.25	1.55	1.74
	0.50	0.00	0.47	2.19	0.67	0.20
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.779	0.782	2.766	1.251	2.731	1.740
	0.456	0.044	0.161	1.587	0.701	0.227
STD. DEVIATIONS	0.016	0.008	0.058	0.012	0.013	0.000
	0.009	0.009	0.002	0.008	0.005	0.005

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS	0.0112	0.0105	0.0082	0.0068	0.0028	0.0023
	0.0157	0.0188	0.0170	0.0154	0.0130	0.0117
STD. DEVIATIONS	0.0023	0.0025	0.0021	0.0013	0.0009	0.0019
	0.0075	0.0062	0.0040	0.0029	0.0021	0.0018

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	13.36	(0.000)	969936.5	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	13.225	(0.0334)	960139.69	98.990
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.13330	(0.03073)	9677.896	0.99779
CHANGE IN WATER STORAGE	0.002	(0.0129)	118.48	0.012

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	1.10	79860.000
RUNOFF	0.000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000907	65.84068
SNOW WATER	0.79	57168.4570
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.3207
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1360

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.4865	0.2072
2	52.5599	0.2920
3	0.8275	0.0345
SNOW WATER	0.000	

EVAPORATION BASIN CALCULATIONS
MASS BALANCE

Promontory Landfill Evaporation Basin Mass Balance

RAINFALL (IN)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
30-yr Average	1.19	1.18	1.41	1.49	1.74	0.85	0.66	1.13	1.45	1.84	1.19	1.17	15.30
Std Dev	0.62	0.78	1.00	1.41	1.14	0.91	0.78	1.03	1.59	1.23	1.05	0.95	12.49
25-yr (in)	2.28	2.55	3.16	3.96	3.74	2.44	2.03	2.93	4.23	3.99	3.03	2.83	37.16

LEACHATE (IN)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Leachate	0.01	0.01	0.01	0.01	0.00	0.00	0.02	0.02	0.02	0.02	0.01	0.01	0.13
Std Dev	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.04
25-yr (in)	0.02	0.01	0.01	0.01	0.00	0.01	0.03	0.03	0.02	0.02	0.02	0.01	0.20

EVAPORATION (IN)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
30-yr Average	0.82	1.27	2.35	3.69	5.30	6.48	7.37	6.35	4.28	2.59	1.22	0.77	42.49
Std Dev	0.13	0.24	0.51	0.73	0.68	0.74	0.42	0.42	0.51	0.50	0.27	0.11	5.26
25-yr	0.59	0.85	1.46	2.41	4.11	5.19	6.64	5.62	3.39	1.72	0.75	0.58	33.29

Cell Area [redacted]

Single Lagoon Size Requirments

Width [redacted] ft

Length 80 ft

Required Area 6400 sq. ft **0.15 acres**

Seepage [redacted] gal/acre/day

January

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	2.28	1,213	0.59	316	-	-	1,710	4,419
FEB	5,702	762	1.18	629	1.27	677	-	-	714	5,133
MAR	4,453	595	1.41	752	2.35	1,253	-	-	94	5,227
APR	3,693	494	1.49	795	3.69	1,968	-	-	(680)	4,547
MAY	1,521	203	1.74	928	5.30	2,827	-	-	(1,695)	2,852
JUN	1,249	167	0.85	453	6.48	3,456	-	-	(2,836)	16
JUL	8,526	1,140	0.66	352	7.37	3,931	-	-	(2,439)	(2,423)
AUG	10,209	1,365	1.13	603	6.35	3,387	-	-	(1,419)	(3,842)
SEP	9,232	1,234	1.45	773	4.28	2,283	-	-	(275)	(4,118)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	16.39	8,739	42.26	22,540	-	-	(4,118)	

February

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	3,719
FEB	5,702	762	2.55	1,357	0.85	453	-	-	1,666	5,385
MAR	4,453	595	1.41	752	2.35	1,253	-	-	94	5,479
APR	3,693	494	1.49	795	3.69	1,968	-	-	(680)	4,799
MAY	1,521	203	1.74	928	5.30	2,827	-	-	(1,695)	3,104
JUN	1,249	167	0.85	453	6.48	3,456	-	-	(2,836)	268
JUL	8,526	1,140	0.66	352	7.37	3,931	-	-	(2,439)	(2,171)
AUG	10,209	1,365	1.13	603	6.35	3,387	-	-	(1,419)	(3,590)
SEP	9,232	1,234	1.45	773	4.28	2,283	-	-	(275)	(3,866)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	16.67	8,888	42.07	22,437	-	-	(3,866)	

March

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	3,719
FEB	5,702	762	1.18	629	1.27	677	-	-	714	4,433
MAR	4,453	595	3.16	1,685	1.46	777	-	-	1,503	5,936
APR	3,693	494	1.49	795	3.69	1,968	-	-	(680)	5,256
MAY	1,521	203	1.74	928	5.30	2,827	-	-	(1,695)	3,561
JUN	1,249	167	0.85	453	6.48	3,456	-	-	(2,836)	725
JUL	8,526	1,140	0.66	352	7.37	3,931	-	-	(2,439)	(1,714)
AUG	10,209	1,365	1.13	603	6.35	3,387	-	-	(1,419)	(3,133)
SEP	9,232	1,234	1.45	773	4.28	2,283	-	-	(275)	(3,408)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	17.05	9,093	41.60	22,185	-	-	(3,408)	

April

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	3,719
FEB	5,702	762	1.18	629	1.27	677	-	-	714	4,433
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	5,012
APR	3,693	494	4.96	2,645	2.41	1,285	-	-	1,854	6,866
MAY	1,521	203	1.74	928	5.30	2,827	-	-	(1,695)	5,170
JUN	1,249	167	0.85	453	6.48	3,456	-	-	(2,836)	2,334
JUL	8,526	1,140	0.66	352	7.37	3,931	-	-	(2,439)	(105)
AUG	10,209	1,365	1.13	603	6.35	3,387	-	-	(1,419)	(1,524)
SEP	9,232	1,234	1.45	773	4.28	2,283	-	-	(275)	(1,799)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	19.68	10,496	41.21	21,979	-	-	(1,799)	

May

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	3,719
FEB	5,702	762	1.18	629	1.27	677	-	-	714	4,433
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	5,012
APR	3,693	494	2.49	1,328	3.69	1,968	-	-	(146)	4,866
MAY	1,521	203	3.91	2,085	4.11	2,192	-	-	97	4,962
JUN	1,249	167	0.85	453	6.48	3,456	-	-	(2,836)	2,126
JUL	8,526	1,140	0.66	352	7.37	3,931	-	-	(2,439)	(313)
AUG	10,209	1,365	1.13	603	6.35	3,387	-	-	(1,419)	(1,732)
SEP	9,232	1,234	1.45	773	4.28	2,283	-	-	(275)	(2,007)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	19.38	10,336	41.30	22,027	-	-	(2,007)	

June

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	3,719
FEB	5,702	762	1.18	629	1.27	677	-	-	714	4,433
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	5,012
APR	3,693	494	2.49	1,328	3.69	1,968	-	-	(146)	4,866
MAY	1,521	203	1.91	1,019	5.30	2,827	-	-	(1,605)	3,261
JUN	1,249	167	2.70	1,440	5.19	2,768	-	-	(1,161)	2,100
JUL	8,526	1,140	0.66	352	7.37	3,931	-	-	(2,439)	(339)
AUG	10,209	1,365	1.13	603	6.35	3,387	-	-	(1,419)	(1,758)
SEP	9,232	1,234	1.45	773	4.28	2,283	-	-	(275)	(2,034)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	19.23	10,256	41.20	21,973	-	-	(2,034)	

July

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	3,719
FEB	5,702	762	1.18	629	1.27	677	-	-	714	4,433
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	5,012
APR	3,693	494	2.49	1,328	3.69	1,968	-	-	(146)	4,866
MAY	1,521	203	1.91	1,019	5.30	2,827	-	-	(1,605)	3,261
JUN	1,249	167	1.11	592	6.48	3,456	-	-	(2,697)	564
JUL	8,526	1,140	3.29	1,755	6.64	3,541	-	-	(647)	(83)
AUG	10,209	1,365	1.13	603	6.35	3,387	-	-	(1,419)	(1,502)
SEP	9,232	1,234	1.45	773	4.28	2,283	-	-	(275)	(1,778)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	20.27	10,811	41.76	22,272	-	-	(1,778)	

August

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	3,719
FEB	5,702	762	1.18	629	1.27	677	-	-	714	4,433
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	5,012
APR	3,693	494	2.49	1,328	3.69	1,968	-	-	(146)	4,866
MAY	1,521	203	1.91	1,019	5.30	2,827	-	-	(1,605)	3,261
JUN	1,249	167	1.11	592	6.48	3,456	-	-	(2,697)	564
JUL	8,526	1,140	1.92	1,024	7.37	3,931	-	-	(1,767)	(1,203)
AUG	10,209	1,365	2.74	1,461	5.62	2,997	-	-	(171)	(1,374)
SEP	9,232	1,234	1.45	773	4.28	2,283	-	-	(275)	(1,650)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	20.51	10,939	41.76	22,272	-	-	(1,650)	

September

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	3,719
FEB	5,702	762	1.18	629	1.27	677	-	-	714	4,433
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	5,012
APR	3,693	494	2.49	1,328	3.69	1,968	-	-	(146)	4,866
MAY	1,521	203	1.91	1,019	5.30	2,827	-	-	(1,605)	3,261
JUN	1,249	167	1.11	592	6.48	3,456	-	-	(2,697)	564
JUL	8,526	1,140	1.92	1,024	7.37	3,931	-	-	(1,767)	(1,203)
AUG	10,209	1,365	0.94	501	6.35	3,387	-	-	(1,521)	(2,724)
SEP	9,232	1,234	4.32	2,304	3.39	1,808	-	-	1,730	(994)
OCT	8,363	1,118	1.84	981	2.59	1,381	-	-	718	718
NOV	7,060	944	1.19	635	1.22	651	-	-	928	1,646
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	2,708
TOTAL	72,443	9,684	21.58	11,509	41.60	22,187	-	-	(994)	

October

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	5,313
FEB	5,702	762	1.18	629	1.27	677	-	-	714	6,027
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	6,607
APR	3,693	494	2.49	1,328	3.69	1,968	-	-	(146)	6,460
MAY	1,521	203	1.91	1,019	5.30	2,827	-	-	(1,605)	4,856
JUN	1,249	167	1.11	592	6.48	3,456	-	-	(2,697)	2,158
JUL	8,526	1,140	1.92	1,024	7.37	3,931	-	-	(1,767)	391
AUG	10,209	1,365	0.94	501	6.35	3,387	-	-	(1,521)	(1,129)
SEP	9,232	1,234	1.54	821	4.28	2,283	-	-	(227)	(1,356)
OCT	8,363	1,118	3.96	2,112	1.72	917	-	-	2,313	2,313
NOV	7,060	944	1.19	635	1.22	651	-	-	928	3,240
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	4,303
TOTAL	72,443	9,684	20.92	11,157	41.62	22,197	-	-	(1,356)	

November

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	5,201
FEB	5,702	762	1.18	629	1.27	677	-	-	714	5,915
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	6,495
APR	3,693	494	2.49	1,328	3.69	1,968	-	-	(146)	6,348
MAY	1,521	203	1.91	1,019	5.30	2,827	-	-	(1,605)	4,744
JUN	1,249	167	1.11	592	6.48	3,456	-	-	(2,697)	2,046
JUL	8,526	1,140	1.92	1,024	7.37	3,931	-	-	(1,767)	279
AUG	10,209	1,365	0.94	501	6.35	3,387	-	-	(1,521)	(1,241)
SEP	9,232	1,234	1.54	821	4.28	2,283	-	-	(227)	(1,468)
OCT	8,363	1,118	1.81	965	2.59	1,381	-	-	702	702
NOV	7,060	944	3.53	1,883	0.75	400	-	-	2,426	3,128
DEC	6,354	849	1.17	624	0.77	411	-	-	1,063	4,191
TOTAL	72,443	9,684	21.11	11,259	42.02	22,411	-	-	(1,468)	

December

	gal.	cu.ft.	inches	cu.ft.	inches	cu. ft.	gal.	cu. ft.	cu. ft.	cu. ft.
JAN	6,082	813	1.19	635	0.82	437	-	-	1,010	5,121
FEB	5,702	762	1.18	629	1.27	677	-	-	714	5,835
MAR	4,453	595	2.32	1,237	2.35	1,253	-	-	579	6,415
APR	3,693	494	2.49	1,328	3.69	1,968	-	-	(146)	6,268
MAY	1,521	203	1.91	1,019	5.30	2,827	-	-	(1,605)	4,664
JUN	1,249	167	1.11	592	6.48	3,456	-	-	(2,697)	1,966
JUL	8,526	1,140	1.92	1,024	7.37	3,931	-	-	(1,767)	199
AUG	10,209	1,365	0.94	501	6.35	3,387	-	-	(1,521)	(1,321)
SEP	9,232	1,234	1.54	821	4.28	2,283	-	-	(227)	(1,548)
OCT	8,363	1,118	1.81	965	2.59	1,381	-	-	702	702
NOV	7,060	944	1.69	901	1.22	651	-	-	1,194	1,896
DEC	6,354	849	3.14	1,675	0.58	309	-	-	2,215	4,111
TOTAL	72,443	9,684	21.24	11,328	42.30	22,560	-	-	(1,548)	

APPENDIX I
LANDFILL GAS EMISSIONS CALCULATIONS

EPA DEFAULT PARAMETERS

Source: X:\SHIRE\1DRAWING\PROMON~1\CLASSI~1\PERMIT~1\LANDGEM\1500EPA.PRM

Model Parameters

Lo:	170 m^3/Mg	***** User Mode Selection *****
k:	0.02 1/yr	***** User Mode Selection *****
NMOC:	4000 ppmv	***** User Mode Selection *****
Methane:	50% volume	
Carbon Dioxide:	50% volume	

Landfill Parameters

Landfill type: No Co-Disposal
Year Opened: 2003 Current Year: 2080 Closure Year: 2080
Capacity: 223599505 Mg
Average Acceptance Rate Required from
Current Year to Closure Year: 0 Mg/year

Model Results

Year	Refuse In Place (Mg)	NMOC Emission Rate (Mg/yr)	(Cubic m/yr)
2004	4.08E+05	3.98E+01	1.11E+04
2005	1.02E+06	9.87E+01	2.75E+04
2006	1.84E+06	1.76E+02	4.92E+04
2007	2.68E+06	2.55E+02	7.11E+04
2008	3.54E+06	3.34E+02	9.33E+04
2009	4.44E+06	4.15E+02	1.16E+05
2010	5.36E+06	4.96E+02	1.38E+05
2011	6.30E+06	5.79E+02	1.61E+05
2012	7.28E+06	6.62E+02	1.85E+05
2013	8.28E+06	7.47E+02	2.08E+05
2014	9.32E+06	8.33E+02	2.32E+05
2015	1.04E+07	9.20E+02	2.57E+05
2016	1.15E+07	1.01E+03	2.82E+05
2017	1.26E+07	1.10E+03	3.07E+05
2018	1.38E+07	1.19E+03	3.32E+05
2019	1.50E+07	1.28E+03	3.58E+05
2020	1.62E+07	1.38E+03	3.85E+05
2021	1.75E+07	1.48E+03	4.12E+05
2022	1.88E+07	1.57E+03	4.39E+05
2023	2.01E+07	1.68E+03	4.67E+05
2024	2.15E+07	1.78E+03	4.96E+05
2025	2.30E+07	1.88E+03	5.25E+05
2026	2.44E+07	1.99E+03	5.55E+05
2027	2.60E+07	2.10E+03	5.85E+05
2028	2.75E+07	2.21E+03	6.16E+05
2029	2.91E+07	2.32E+03	6.48E+05
2030	3.08E+07	2.44E+03	6.80E+05

2031	3.25E+07	2.56E+03	7.13E+05
2032	3.43E+07	2.68E+03	7.47E+05
2033	3.61E+07	2.80E+03	7.81E+05
2034	3.79E+07	2.93E+03	8.17E+05
2035	3.99E+07	3.06E+03	8.53E+05
2036	4.19E+07	3.19E+03	8.90E+05
2037	4.39E+07	3.33E+03	9.28E+05
2038	4.60E+07	3.46E+03	9.67E+05
2039	4.82E+07	3.61E+03	1.01E+06
2040	5.04E+07	3.75E+03	1.05E+06
2041	5.27E+07	3.90E+03	1.09E+06
2042	5.51E+07	4.06E+03	1.13E+06
2043	5.75E+07	4.21E+03	1.18E+06
2044	6.00E+07	4.38E+03	1.22E+06
2045	6.26E+07	4.54E+03	1.27E+06
2046	6.53E+07	4.71E+03	1.31E+06
2047	6.80E+07	4.88E+03	1.36E+06
2048	7.08E+07	5.06E+03	1.41E+06
2049	7.37E+07	5.25E+03	1.46E+06
2050	7.67E+07	5.44E+03	1.52E+06
2051	7.98E+07	5.63E+03	1.57E+06
2052	8.30E+07	5.83E+03	1.63E+06
2053	8.63E+07	6.03E+03	1.68E+06
2054	8.96E+07	6.24E+03	1.74E+06
2055	9.31E+07	6.46E+03	1.80E+06
2056	9.67E+07	6.68E+03	1.86E+06
2057	1.00E+08	6.90E+03	1.93E+06
2058	1.04E+08	7.14E+03	1.99E+06
2059	1.08E+08	7.38E+03	2.06E+06
2060	1.12E+08	7.62E+03	2.13E+06
2061	1.16E+08	7.88E+03	2.20E+06
2062	1.21E+08	8.14E+03	2.27E+06
2063	1.25E+08	8.41E+03	2.35E+06
2064	1.30E+08	8.68E+03	2.42E+06
2065	1.34E+08	8.97E+03	2.50E+06
2066	1.39E+08	9.26E+03	2.58E+06
2067	1.44E+08	9.56E+03	2.67E+06
2068	1.49E+08	9.87E+03	2.75E+06
2069	1.54E+08	1.02E+04	2.84E+06
2070	1.60E+08	1.05E+04	2.93E+06
2071	1.65E+08	1.08E+04	3.03E+06
2072	1.71E+08	1.12E+04	3.12E+06
2073	1.77E+08	1.15E+04	3.22E+06
2074	1.83E+08	1.19E+04	3.32E+06
2075	1.89E+08	1.23E+04	3.43E+06
2076	1.96E+08	1.27E+04	3.54E+06
2077	2.02E+08	1.31E+04	3.65E+06
2078	2.09E+08	1.35E+04	3.76E+06
2079	2.16E+08	1.39E+04	3.88E+06
2080	2.24E+08	1.43E+04	4.00E+06
2081	2.24E+08	1.41E+04	3.92E+06
2082	2.24E+08	1.38E+04	3.84E+06

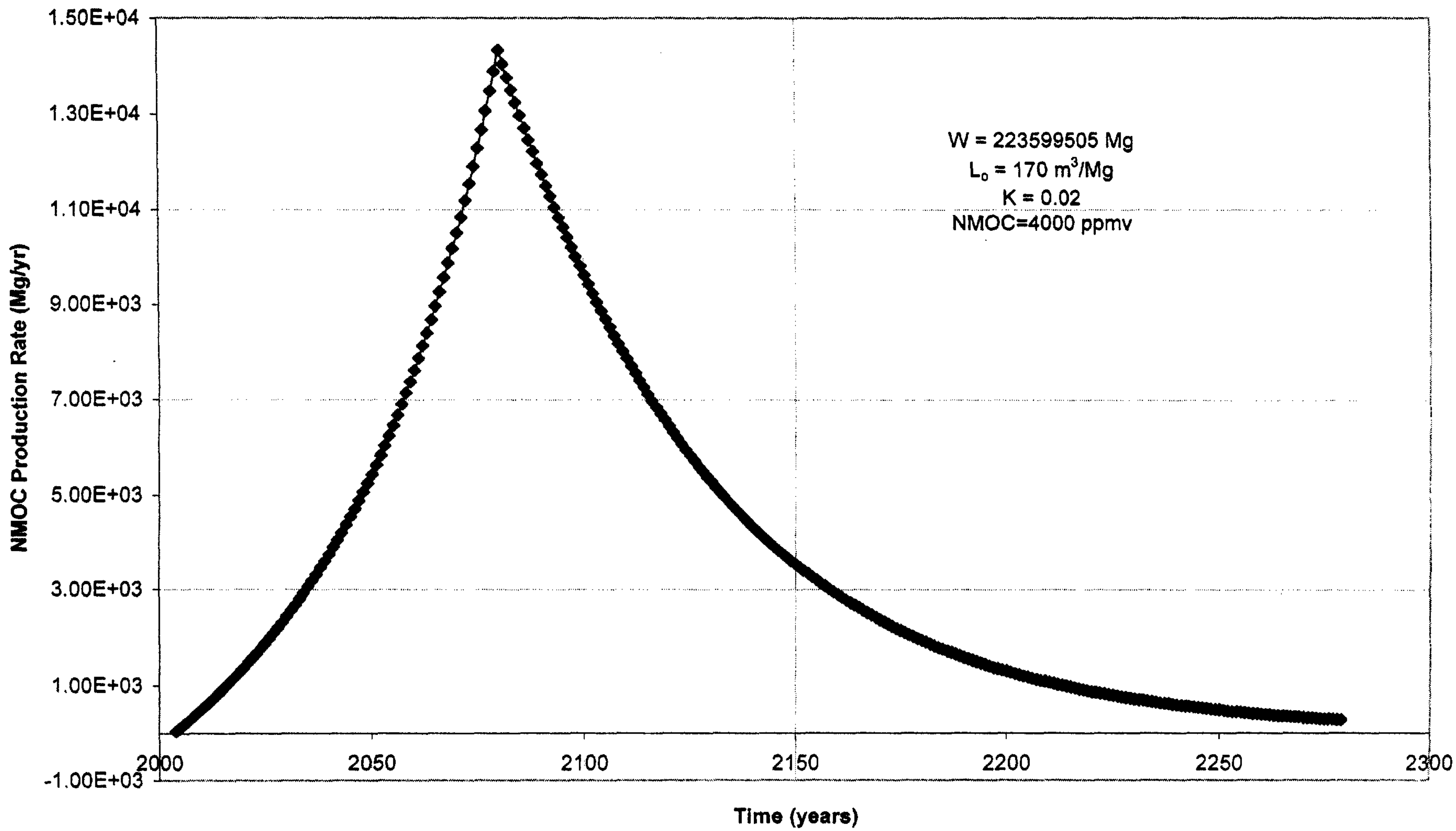
2083	2.24E+08	1.35E+04	3.77E+06
2084	2.24E+08	1.32E+04	3.69E+06
2085	2.24E+08	1.30E+04	3.62E+06
2086	2.24E+08	1.27E+04	3.55E+06
2087	2.24E+08	1.25E+04	3.48E+06
2088	2.24E+08	1.22E+04	3.41E+06
2089	2.24E+08	1.20E+04	3.34E+06
2090	2.24E+08	1.17E+04	3.27E+06
2091	2.24E+08	1.15E+04	3.21E+06
2092	2.24E+08	1.13E+04	3.15E+06
2093	2.24E+08	1.11E+04	3.08E+06
2094	2.24E+08	1.08E+04	3.02E+06
2095	2.24E+08	1.06E+04	2.96E+06
2096	2.24E+08	1.04E+04	2.90E+06
2097	2.24E+08	1.02E+04	2.85E+06
2098	2.24E+08	1.00E+04	2.79E+06
2099	2.24E+08	9.80E+03	2.74E+06
2100	2.24E+08	9.61E+03	2.68E+06
2101	2.24E+08	9.42E+03	2.63E+06
2102	2.24E+08	9.23E+03	2.58E+06
2103	2.24E+08	9.05E+03	2.53E+06
2104	2.24E+08	8.87E+03	2.48E+06
2105	2.24E+08	8.70E+03	2.43E+06
2106	2.24E+08	8.52E+03	2.38E+06
2107	2.24E+08	8.35E+03	2.33E+06
2108	2.24E+08	8.19E+03	2.28E+06
2109	2.24E+08	8.03E+03	2.24E+06
2110	2.24E+08	7.87E+03	2.20E+06
2111	2.24E+08	7.71E+03	2.15E+06
2112	2.24E+08	7.56E+03	2.11E+06
2113	2.24E+08	7.41E+03	2.07E+06
2114	2.24E+08	7.26E+03	2.03E+06
2115	2.24E+08	7.12E+03	1.99E+06
2116	2.24E+08	6.98E+03	1.95E+06
2117	2.24E+08	6.84E+03	1.91E+06
2118	2.24E+08	6.70E+03	1.87E+06
2119	2.24E+08	6.57E+03	1.83E+06
2120	2.24E+08	6.44E+03	1.80E+06
2121	2.24E+08	6.31E+03	1.76E+06
2122	2.24E+08	6.19E+03	1.73E+06
2123	2.24E+08	6.07E+03	1.69E+06
2124	2.24E+08	5.95E+03	1.66E+06
2125	2.24E+08	5.83E+03	1.63E+06
2126	2.24E+08	5.71E+03	1.59E+06
2127	2.24E+08	5.60E+03	1.56E+06
2128	2.24E+08	5.49E+03	1.53E+06
2129	2.24E+08	5.38E+03	1.50E+06
2130	2.24E+08	5.27E+03	1.47E+06
2131	2.24E+08	5.17E+03	1.44E+06
2132	2.24E+08	5.07E+03	1.41E+06
2133	2.24E+08	4.97E+03	1.39E+06
2134	2.24E+08	4.87E+03	1.36E+06

2135	2.24E+08	4.77E+03	1.33E+06
2136	2.24E+08	4.68E+03	1.31E+06
2137	2.24E+08	4.59E+03	1.28E+06
2138	2.24E+08	4.49E+03	1.25E+06
2139	2.24E+08	4.41E+03	1.23E+06
2140	2.24E+08	4.32E+03	1.21E+06
2141	2.24E+08	4.23E+03	1.18E+06
2142	2.24E+08	4.15E+03	1.16E+06
2143	2.24E+08	4.07E+03	1.13E+06
2144	2.24E+08	3.99E+03	1.11E+06
2145	2.24E+08	3.91E+03	1.09E+06
2146	2.24E+08	3.83E+03	1.07E+06
2147	2.24E+08	3.75E+03	1.05E+06
2148	2.24E+08	3.68E+03	1.03E+06
2149	2.24E+08	3.61E+03	1.01E+06
2150	2.24E+08	3.54E+03	9.86E+05
2151	2.24E+08	3.47E+03	9.67E+05
2152	2.24E+08	3.40E+03	9.48E+05
2153	2.24E+08	3.33E+03	9.29E+05
2154	2.24E+08	3.26E+03	9.10E+05
2155	2.24E+08	3.20E+03	8.92E+05
2156	2.24E+08	3.14E+03	8.75E+05
2157	2.24E+08	3.07E+03	8.57E+05
2158	2.24E+08	3.01E+03	8.40E+05
2159	2.24E+08	2.95E+03	8.24E+05
2160	2.24E+08	2.89E+03	8.08E+05
2161	2.24E+08	2.84E+03	7.92E+05
2162	2.24E+08	2.78E+03	7.76E+05
2163	2.24E+08	2.73E+03	7.60E+05
2164	2.24E+08	2.67E+03	7.45E+05
2165	2.24E+08	2.62E+03	7.31E+05
2166	2.24E+08	2.57E+03	7.16E+05
2167	2.24E+08	2.52E+03	7.02E+05
2168	2.24E+08	2.47E+03	6.88E+05
2169	2.24E+08	2.42E+03	6.74E+05
2170	2.24E+08	2.37E+03	6.61E+05
2171	2.24E+08	2.32E+03	6.48E+05
2172	2.24E+08	2.28E+03	6.35E+05
2173	2.24E+08	2.23E+03	6.23E+05
2174	2.24E+08	2.19E+03	6.10E+05
2175	2.24E+08	2.14E+03	5.98E+05
2176	2.24E+08	2.10E+03	5.86E+05
2177	2.24E+08	2.06E+03	5.75E+05
2178	2.24E+08	2.02E+03	5.63E+05
2179	2.24E+08	1.98E+03	5.52E+05
2180	2.24E+08	1.94E+03	5.41E+05
2181	2.24E+08	1.90E+03	5.31E+05
2182	2.24E+08	1.86E+03	5.20E+05
2183	2.24E+08	1.83E+03	5.10E+05
2184	2.24E+08	1.79E+03	5.00E+05
2185	2.24E+08	1.76E+03	4.90E+05
2186	2.24E+08	1.72E+03	4.80E+05

2187	2.24E+08	1.69E+03	4.71E+05
2188	2.24E+08	1.65E+03	4.61E+05
2189	2.24E+08	1.62E+03	4.52E+05
2190	2.24E+08	1.59E+03	4.43E+05
2191	2.24E+08	1.56E+03	4.34E+05
2192	2.24E+08	1.53E+03	4.26E+05
2193	2.24E+08	1.50E+03	4.17E+05
2194	2.24E+08	1.47E+03	4.09E+05
2195	2.24E+08	1.44E+03	4.01E+05
2196	2.24E+08	1.41E+03	3.93E+05
2197	2.24E+08	1.38E+03	3.85E+05
2198	2.24E+08	1.35E+03	3.78E+05
2199	2.24E+08	1.33E+03	3.70E+05
2200	2.24E+08	1.30E+03	3.63E+05
2201	2.24E+08	1.28E+03	3.56E+05
2202	2.24E+08	1.25E+03	3.49E+05
2203	2.24E+08	1.23E+03	3.42E+05
2204	2.24E+08	1.20E+03	3.35E+05
2205	2.24E+08	1.18E+03	3.28E+05
2206	2.24E+08	1.15E+03	3.22E+05
2207	2.24E+08	1.13E+03	3.15E+05
2208	2.24E+08	1.11E+03	3.09E+05
2209	2.24E+08	1.09E+03	3.03E+05
2210	2.24E+08	1.07E+03	2.97E+05
2211	2.24E+08	1.04E+03	2.91E+05
2212	2.24E+08	1.02E+03	2.85E+05
2213	2.24E+08	1.00E+03	2.80E+05
2214	2.24E+08	9.83E+02	2.74E+05
2215	2.24E+08	9.63E+02	2.69E+05
2216	2.24E+08	9.44E+02	2.64E+05
2217	2.24E+08	9.26E+02	2.58E+05
2218	2.24E+08	9.07E+02	2.53E+05
2219	2.24E+08	8.89E+02	2.48E+05
2220	2.24E+08	8.72E+02	2.43E+05
2221	2.24E+08	8.55E+02	2.38E+05
2222	2.24E+08	8.38E+02	2.34E+05
2223	2.24E+08	8.21E+02	2.29E+05
2224	2.24E+08	8.05E+02	2.25E+05
2225	2.24E+08	7.89E+02	2.20E+05
2226	2.24E+08	7.73E+02	2.16E+05
2227	2.24E+08	7.58E+02	2.11E+05
2228	2.24E+08	7.43E+02	2.07E+05
2229	2.24E+08	7.28E+02	2.03E+05
2230	2.24E+08	7.14E+02	1.99E+05
2231	2.24E+08	7.00E+02	1.95E+05
2232	2.24E+08	6.86E+02	1.91E+05
2233	2.24E+08	6.72E+02	1.88E+05
2234	2.24E+08	6.59E+02	1.84E+05
2235	2.24E+08	6.46E+02	1.80E+05
2236	2.24E+08	6.33E+02	1.77E+05
2237	2.24E+08	6.21E+02	1.73E+05
2238	2.24E+08	6.08E+02	1.70E+05

2239	2.24E+08	5.96E+02	1.66E+05
2240	2.24E+08	5.84E+02	1.63E+05
2241	2.24E+08	5.73E+02	1.60E+05
2242	2.24E+08	5.61E+02	1.57E+05
2243	2.24E+08	5.50E+02	1.54E+05
2244	2.24E+08	5.39E+02	1.51E+05
2245	2.24E+08	5.29E+02	1.48E+05
2246	2.24E+08	5.18E+02	1.45E+05
2247	2.24E+08	5.08E+02	1.42E+05
2248	2.24E+08	4.98E+02	1.39E+05
2249	2.24E+08	4.88E+02	1.36E+05
2250	2.24E+08	4.78E+02	1.34E+05
2251	2.24E+08	4.69E+02	1.31E+05
2252	2.24E+08	4.60E+02	1.28E+05
2253	2.24E+08	4.51E+02	1.26E+05
2254	2.24E+08	4.42E+02	1.23E+05
2255	2.24E+08	4.33E+02	1.21E+05
2256	2.24E+08	4.24E+02	1.18E+05
2257	2.24E+08	4.16E+02	1.16E+05
2258	2.24E+08	4.08E+02	1.14E+05
2259	2.24E+08	4.00E+02	1.12E+05
2260	2.24E+08	3.92E+02	1.09E+05
2261	2.24E+08	3.84E+02	1.07E+05
2262	2.24E+08	3.76E+02	1.05E+05
2263	2.24E+08	3.69E+02	1.03E+05
2264	2.24E+08	3.62E+02	1.01E+05
2265	2.24E+08	3.54E+02	9.89E+04
2266	2.24E+08	3.47E+02	9.69E+04
2267	2.24E+08	3.41E+02	9.50E+04
2268	2.24E+08	3.34E+02	9.31E+04
2269	2.24E+08	3.27E+02	9.13E+04
2270	2.24E+08	3.21E+02	8.95E+04
2271	2.24E+08	3.14E+02	8.77E+04
2272	2.24E+08	3.08E+02	8.60E+04
2273	2.24E+08	3.02E+02	8.43E+04
2274	2.24E+08	2.96E+02	8.26E+04
2275	2.24E+08	2.90E+02	8.10E+04
2276	2.24E+08	2.84E+02	7.94E+04
2277	2.24E+08	2.79E+02	7.78E+04
2278	2.24E+08	2.73E+02	7.62E+04
2279	2.24E+08	2.68E+02	7.47E+04

EPA PROJECTED NMOC Emission Rate



SALT LAKE VALLEY SOLID WASTE MANAGEMENT FACILITY PARAMETERS

Source: X:\SHIRE\1DRAWING\PROMON~1\CLASSI~1\PERMIT~1\LANDGEM\1500SLC.PRM

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Model Parameters

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Lo:	169.9 m^3/Mg	***** User Mode Selection *****
k:	0.02 1/yr	***** User Mode Selection *****
NMOC:	300 ppmv	***** User Mode Selection *****
Methane:	50% volume	
Carbon Dioxide:	50% volume	

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Landfill Parameters

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Landfill type: No Co-Disposal
Year Opened: 2003 Current Year: 2091 Closure Year: 2090
Capacity: 314563700 Mg
Average Acceptance Rate Required from
Current Year to Closure Year: 5035673 Mg/year

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Model Results

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Year	NMOC Emission Rate Refuse In Place (Mg	(Mg/yr)	(Cubic m/yr)
2004	4.08E+05	2.98E+00	8.32E+02
2005	1.02E+06	7.40E+00	2.06E+03
2006	1.84E+06	1.32E+01	3.69E+03
2007	2.68E+06	1.91E+01	5.33E+03
2008	3.54E+06	2.51E+01	6.99E+03
2009	4.44E+06	3.11E+01	8.67E+03
2010	5.36E+06	3.72E+01	1.04E+04
2011	6.30E+06	4.34E+01	1.21E+04
2012	7.28E+06	4.96E+01	1.38E+04
2013	8.28E+06	5.60E+01	1.56E+04
2014	9.32E+06	6.24E+01	1.74E+04
2015	1.04E+07	6.90E+01	1.92E+04
2016	1.15E+07	7.56E+01	2.11E+04
2017	1.26E+07	8.24E+01	2.30E+04
2018	1.38E+07	8.93E+01	2.49E+04
2019	1.50E+07	9.63E+01	2.69E+04
2020	1.62E+07	1.03E+02	2.88E+04
2021	1.75E+07	1.11E+02	3.09E+04
2022	1.88E+07	1.18E+02	3.29E+04
2023	2.01E+07	1.26E+02	3.50E+04
2024	2.15E+07	1.33E+02	3.72E+04
2025	2.30E+07	1.41E+02	3.94E+04
2026	2.44E+07	1.49E+02	4.16E+04
2027	2.60E+07	1.57E+02	4.39E+04
2028	2.75E+07	1.66E+02	4.62E+04
2029	2.91E+07	1.74E+02	4.85E+04
2030	3.08E+07	1.83E+02	5.10E+04

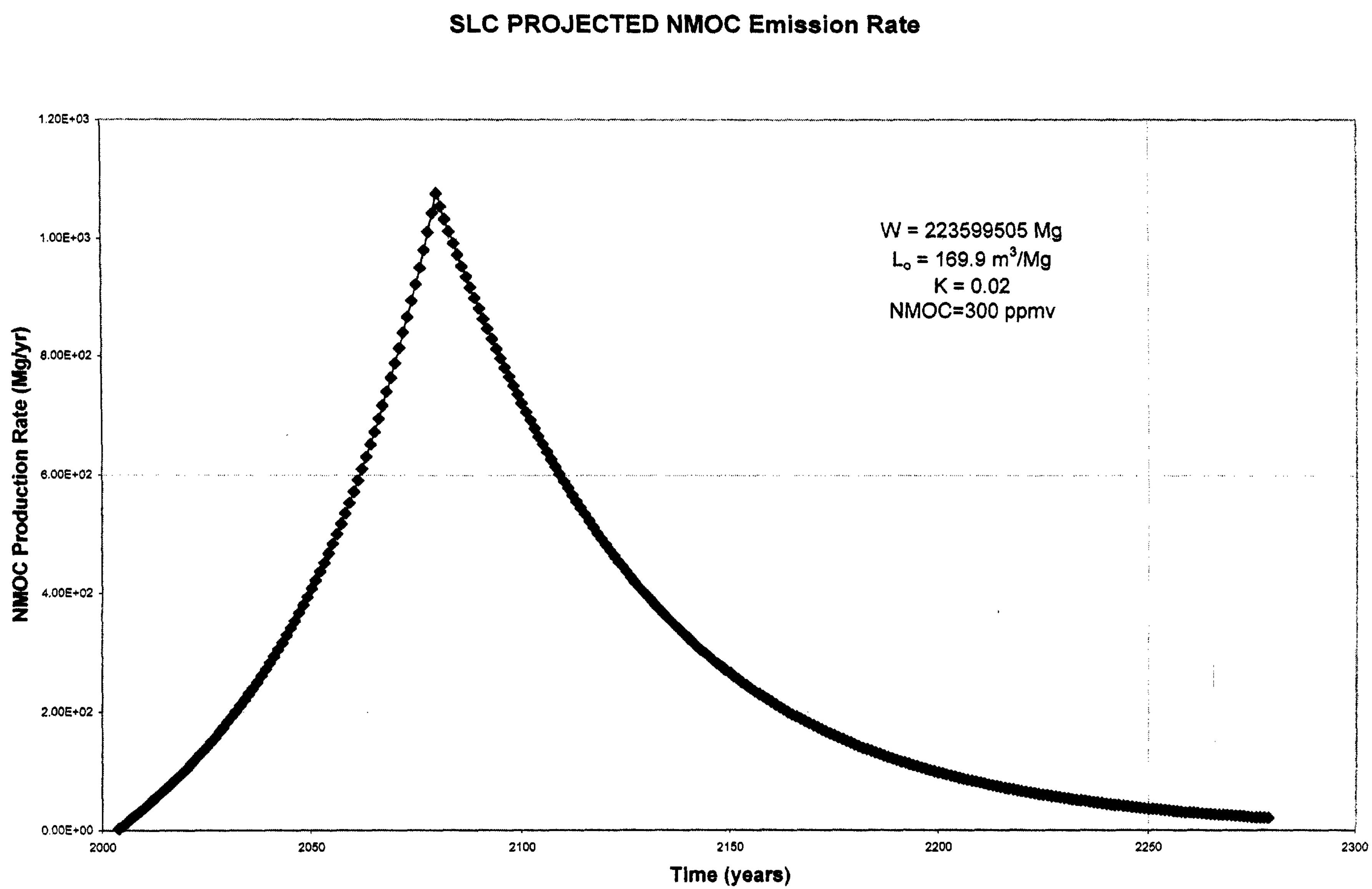
2031	3.25E+07	1.92E+02	5.34E+04
2032	3.43E+07	2.01E+02	5.60E+04
2033	3.61E+07	2.10E+02	5.86E+04
2034	3.79E+07	2.19E+02	6.12E+04
2035	3.99E+07	2.29E+02	6.39E+04
2036	4.19E+07	2.39E+02	6.67E+04
2037	4.39E+07	2.49E+02	6.95E+04
2038	4.60E+07	2.60E+02	7.25E+04
2039	4.82E+07	2.70E+02	7.54E+04
2040	5.04E+07	2.81E+02	7.85E+04
2041	5.27E+07	2.93E+02	8.16E+04
2042	5.51E+07	3.04E+02	8.48E+04
2043	5.75E+07	3.16E+02	8.81E+04
2044	6.00E+07	3.28E+02	9.15E+04
2045	6.26E+07	3.40E+02	9.49E+04
2046	6.53E+07	3.53E+02	9.85E+04
2047	6.80E+07	3.66E+02	1.02E+05
2048	7.08E+07	3.80E+02	1.06E+05
2049	7.37E+07	3.93E+02	1.10E+05
2050	7.67E+07	4.07E+02	1.14E+05
2051	7.98E+07	4.22E+02	1.18E+05
2052	8.30E+07	4.37E+02	1.22E+05
2053	8.63E+07	4.52E+02	1.26E+05
2054	8.96E+07	4.68E+02	1.31E+05
2055	9.31E+07	4.84E+02	1.35E+05
2056	9.67E+07	5.01E+02	1.40E+05
2057	1.00E+08	5.18E+02	1.44E+05
2058	1.04E+08	5.35E+02	1.49E+05
2059	1.08E+08	5.53E+02	1.54E+05
2060	1.12E+08	5.72E+02	1.59E+05
2061	1.16E+08	5.91E+02	1.65E+05
2062	1.21E+08	6.10E+02	1.70E+05
2063	1.25E+08	6.30E+02	1.76E+05
2064	1.30E+08	6.51E+02	1.82E+05
2065	1.34E+08	6.72E+02	1.88E+05
2066	1.39E+08	6.94E+02	1.94E+05
2067	1.44E+08	7.16E+02	2.00E+05
2068	1.49E+08	7.39E+02	2.06E+05
2069	1.54E+08	7.63E+02	2.13E+05
2070	1.60E+08	7.88E+02	2.20E+05
2071	1.65E+08	8.13E+02	2.27E+05
2072	1.71E+08	8.39E+02	2.34E+05
2073	1.77E+08	8.65E+02	2.41E+05
2074	1.83E+08	8.93E+02	2.49E+05
2075	1.89E+08	9.21E+02	2.57E+05
2076	1.96E+08	9.50E+02	2.65E+05
2077	2.02E+08	9.80E+02	2.73E+05
2078	2.09E+08	1.01E+03	2.82E+05
2079	2.16E+08	1.04E+03	2.91E+05
2080	2.24E+08	1.08E+03	3.00E+05
2081	2.24E+08	1.05E+03	2.94E+05
2082	2.24E+08	1.03E+03	2.88E+05

2083	2.24E+08	1.01E+03	2.82E+05
2084	2.24E+08	9.92E+02	2.77E+05
2085	2.24E+08	9.72E+02	2.71E+05
2086	2.24E+08	9.53E+02	2.66E+05
2087	2.24E+08	9.34E+02	2.61E+05
2088	2.24E+08	9.16E+02	2.56E+05
2089	2.24E+08	8.98E+02	2.50E+05
2090	2.24E+08	8.80E+02	2.45E+05
2091	2.24E+08	8.62E+02	2.41E+05
2092	2.24E+08	8.45E+02	2.36E+05
2093	2.24E+08	8.29E+02	2.31E+05
2094	2.24E+08	8.12E+02	2.27E+05
2095	2.24E+08	7.96E+02	2.22E+05
2096	2.24E+08	7.80E+02	2.18E+05
2097	2.24E+08	7.65E+02	2.13E+05
2098	2.24E+08	7.50E+02	2.09E+05
2099	2.24E+08	7.35E+02	2.05E+05
2100	2.24E+08	7.20E+02	2.01E+05
2101	2.24E+08	7.06E+02	1.97E+05
2102	2.24E+08	6.92E+02	1.93E+05
2103	2.24E+08	6.78E+02	1.89E+05
2104	2.24E+08	6.65E+02	1.86E+05
2105	2.24E+08	6.52E+02	1.82E+05
2106	2.24E+08	6.39E+02	1.78E+05
2107	2.24E+08	6.26E+02	1.75E+05
2108	2.24E+08	6.14E+02	1.71E+05
2109	2.24E+08	6.02E+02	1.68E+05
2110	2.24E+08	5.90E+02	1.65E+05
2111	2.24E+08	5.78E+02	1.61E+05
2112	2.24E+08	5.67E+02	1.58E+05
2113	2.24E+08	5.55E+02	1.55E+05
2114	2.24E+08	5.44E+02	1.52E+05
2115	2.24E+08	5.34E+02	1.49E+05
2116	2.24E+08	5.23E+02	1.46E+05
2117	2.24E+08	5.13E+02	1.43E+05
2118	2.24E+08	5.03E+02	1.40E+05
2119	2.24E+08	4.93E+02	1.37E+05
2120	2.24E+08	4.83E+02	1.35E+05
2121	2.24E+08	4.73E+02	1.32E+05
2122	2.24E+08	4.64E+02	1.29E+05
2123	2.24E+08	4.55E+02	1.27E+05
2124	2.24E+08	4.46E+02	1.24E+05
2125	2.24E+08	4.37E+02	1.22E+05
2126	2.24E+08	4.28E+02	1.20E+05
2127	2.24E+08	4.20E+02	1.17E+05
2128	2.24E+08	4.11E+02	1.15E+05
2129	2.24E+08	4.03E+02	1.13E+05
2130	2.24E+08	3.95E+02	1.10E+05
2131	2.24E+08	3.88E+02	1.08E+05
2132	2.24E+08	3.80E+02	1.06E+05
2133	2.24E+08	3.72E+02	1.04E+05
2134	2.24E+08	3.65E+02	1.02E+05

2135	2.24E+08	3.58E+02	9.98E+04
2136	2.24E+08	3.51E+02	9.78E+04
2137	2.24E+08	3.44E+02	9.59E+04
2138	2.24E+08	3.37E+02	9.40E+04
2139	2.24E+08	3.30E+02	9.21E+04
2140	2.24E+08	3.24E+02	9.03E+04
2141	2.24E+08	3.17E+02	8.85E+04
2142	2.24E+08	3.11E+02	8.68E+04
2143	2.24E+08	3.05E+02	8.50E+04
2144	2.24E+08	2.99E+02	8.34E+04
2145	2.24E+08	2.93E+02	8.17E+04
2146	2.24E+08	2.87E+02	8.01E+04
2147	2.24E+08	2.81E+02	7.85E+04
2148	2.24E+08	2.76E+02	7.69E+04
2149	2.24E+08	2.70E+02	7.54E+04
2150	2.24E+08	2.65E+02	7.39E+04
2151	2.24E+08	2.60E+02	7.25E+04
2152	2.24E+08	2.55E+02	7.10E+04
2153	2.24E+08	2.50E+02	6.96E+04
2154	2.24E+08	2.45E+02	6.82E+04
2155	2.24E+08	2.40E+02	6.69E+04
2156	2.24E+08	2.35E+02	6.56E+04
2157	2.24E+08	2.30E+02	6.43E+04
2158	2.24E+08	2.26E+02	6.30E+04
2159	2.24E+08	2.21E+02	6.18E+04
2160	2.24E+08	2.17E+02	6.05E+04
2161	2.24E+08	2.13E+02	5.93E+04
2162	2.24E+08	2.08E+02	5.82E+04
2163	2.24E+08	2.04E+02	5.70E+04
2164	2.24E+08	2.00E+02	5.59E+04
2165	2.24E+08	1.96E+02	5.48E+04
2166	2.24E+08	1.92E+02	5.37E+04
2167	2.24E+08	1.89E+02	5.26E+04
2168	2.24E+08	1.85E+02	5.16E+04
2169	2.24E+08	1.81E+02	5.06E+04
2170	2.24E+08	1.78E+02	4.96E+04
2171	2.24E+08	1.74E+02	4.86E+04
2172	2.24E+08	1.71E+02	4.76E+04
2173	2.24E+08	1.67E+02	4.67E+04
2174	2.24E+08	1.64E+02	4.57E+04
2175	2.24E+08	1.61E+02	4.48E+04
2176	2.24E+08	1.58E+02	4.40E+04
2177	2.24E+08	1.54E+02	4.31E+04
2178	2.24E+08	1.51E+02	4.22E+04
2179	2.24E+08	1.48E+02	4.14E+04
2180	2.24E+08	1.45E+02	4.06E+04
2181	2.24E+08	1.43E+02	3.98E+04
2182	2.24E+08	1.40E+02	3.90E+04
2183	2.24E+08	1.37E+02	3.82E+04
2184	2.24E+08	1.34E+02	3.75E+04
2185	2.24E+08	1.32E+02	3.67E+04
2186	2.24E+08	1.29E+02	3.60E+04

2187	2.24E+08	1.26E+02	3.53E+04
2188	2.24E+08	1.24E+02	3.46E+04
2189	2.24E+08	1.22E+02	3.39E+04
2190	2.24E+08	1.19E+02	3.32E+04
2191	2.24E+08	1.17E+02	3.26E+04
2192	2.24E+08	1.14E+02	3.19E+04
2193	2.24E+08	1.12E+02	3.13E+04
2194	2.24E+08	1.10E+02	3.07E+04
2195	2.24E+08	1.08E+02	3.01E+04
2196	2.24E+08	1.06E+02	2.95E+04
2197	2.24E+08	1.04E+02	2.89E+04
2198	2.24E+08	1.02E+02	2.83E+04
2199	2.24E+08	9.95E+01	2.77E+04
2200	2.24E+08	9.75E+01	2.72E+04
2201	2.24E+08	9.56E+01	2.67E+04
2202	2.24E+08	9.37E+01	2.61E+04
2203	2.24E+08	9.18E+01	2.56E+04
2204	2.24E+08	9.00E+01	2.51E+04
2205	2.24E+08	8.82E+01	2.46E+04
2206	2.24E+08	8.65E+01	2.41E+04
2207	2.24E+08	8.48E+01	2.36E+04
2208	2.24E+08	8.31E+01	2.32E+04
2209	2.24E+08	8.14E+01	2.27E+04
2210	2.24E+08	7.98E+01	2.23E+04
2211	2.24E+08	7.82E+01	2.18E+04
2212	2.24E+08	7.67E+01	2.14E+04
2213	2.24E+08	7.52E+01	2.10E+04
2214	2.24E+08	7.37E+01	2.06E+04
2215	2.24E+08	7.22E+01	2.02E+04
2216	2.24E+08	7.08E+01	1.98E+04
2217	2.24E+08	6.94E+01	1.94E+04
2218	2.24E+08	6.80E+01	1.90E+04
2219	2.24E+08	6.67E+01	1.86E+04
2220	2.24E+08	6.53E+01	1.82E+04
2221	2.24E+08	6.41E+01	1.79E+04
2222	2.24E+08	6.28E+01	1.75E+04
2223	2.24E+08	6.15E+01	1.72E+04
2224	2.24E+08	6.03E+01	1.68E+04
2225	2.24E+08	5.91E+01	1.65E+04
2226	2.24E+08	5.80E+01	1.62E+04
2227	2.24E+08	5.68E+01	1.59E+04
2228	2.24E+08	5.57E+01	1.55E+04
2229	2.24E+08	5.46E+01	1.52E+04
2230	2.24E+08	5.35E+01	1.49E+04
2231	2.24E+08	5.24E+01	1.46E+04
2232	2.24E+08	5.14E+01	1.43E+04
2233	2.24E+08	5.04E+01	1.41E+04
2234	2.24E+08	4.94E+01	1.38E+04
2235	2.24E+08	4.84E+01	1.35E+04
2236	2.24E+08	4.75E+01	1.32E+04
2237	2.24E+08	4.65E+01	1.30E+04
2238	2.24E+08	4.56E+01	1.27E+04

2239	2.24E+08	4.47E+01	1.25E+04
2240	2.24E+08	4.38E+01	1.22E+04
2241	2.24E+08	4.29E+01	1.20E+04
2242	2.24E+08	4.21E+01	1.17E+04
2243	2.24E+08	4.13E+01	1.15E+04
2244	2.24E+08	4.04E+01	1.13E+04
2245	2.24E+08	3.96E+01	1.11E+04
2246	2.24E+08	3.89E+01	1.08E+04
2247	2.24E+08	3.81E+01	1.06E+04
2248	2.24E+08	3.73E+01	1.04E+04
2249	2.24E+08	3.66E+01	1.02E+04
2250	2.24E+08	3.59E+01	1.00E+04
2251	2.24E+08	3.52E+01	9.81E+03
2252	2.24E+08	3.45E+01	9.61E+03
2253	2.24E+08	3.38E+01	9.42E+03
2254	2.24E+08	3.31E+01	9.24E+03
2255	2.24E+08	3.25E+01	9.05E+03
2256	2.24E+08	3.18E+01	8.87E+03
2257	2.24E+08	3.12E+01	8.70E+03
2258	2.24E+08	3.06E+01	8.53E+03
2259	2.24E+08	3.00E+01	8.36E+03
2260	2.24E+08	2.94E+01	8.19E+03
2261	2.24E+08	2.88E+01	8.03E+03
2262	2.24E+08	2.82E+01	7.87E+03
2263	2.24E+08	2.77E+01	7.71E+03
2264	2.24E+08	2.71E+01	7.56E+03
2265	2.24E+08	2.66E+01	7.41E+03
2266	2.24E+08	2.60E+01	7.27E+03
2267	2.24E+08	2.55E+01	7.12E+03
2268	2.24E+08	2.50E+01	6.98E+03
2269	2.24E+08	2.45E+01	6.84E+03
2270	2.24E+08	2.40E+01	6.71E+03
2271	2.24E+08	2.36E+01	6.57E+03
2272	2.24E+08	2.31E+01	6.44E+03
2273	2.24E+08	2.26E+01	6.32E+03
2274	2.24E+08	2.22E+01	6.19E+03
2275	2.24E+08	2.18E+01	6.07E+03
2276	2.24E+08	2.13E+01	5.95E+03
2277	2.24E+08	2.09E+01	5.83E+03
2278	2.24E+08	2.05E+01	5.72E+03
2279	2.24E+08	2.01E+01	5.60E+03


SLC PROJECTED NMOC Emission Rate
W = 223599505 Mg
L_o = 169.9 m^3/Mg
K = 0.02
NMOC=300 ppmv
NMOC Production Rate (Mg/yr)
1.20E+03
1.00E+03
8.00E+02
6.00E+02
4.00E+02
2.00E+02
0.00E+00
2000
2050
2100
2150
2200
2250
2300
Time (years)

APPENDIX J
RUN-ON/RUN-OFF CALCULATIONS

PRE-DEVELOPED DRAINAGE ANALYSIS

TIME OF CONCENTRATION
PREDEVELOPED DRAINAGE ANALYSIS

Sheet Flow

Description ....Predeveloped Drainage
Manning's n 0.1300
Flow Length ....300.0000 ft
Two Yr, 24 hr Rainfall .... 1.100 in
Land Slope... 0.2000 ft/ft
Computed Sheet flow time.............................> 0.2381 hrs

Shallow Concentrated Flow

Description ....Predeveloped Drainage
Surface..Unpaved
Flow Length ....1000.0000 ft
Watercourse Slope... 0.500 ft/ft
Velocity .... 11.4088 fps
Computed Shallow flow time..........................> 0.0243 hrs

Channel Flow

Description ....Predeveloped Drainage
Flow Area..8.0000 ft2
Wetted Perimeter..96.0000 in
Flow Length ....16846.0000 ft
Channel Slope ....0.0940 ft/ft
Manning's n.. 0.0200
Hydraulic Radius.. 12.0000 in
Velocity .... 22.7799 fps
Computed Channel flow time ....> 0.2054 hrs

Total Time of Concentration .... > 0.4678 hrs
****

PEAK DISCHARGE
PREDEVELOPED DRAINAGE ANALYSIS

SCS TR-55 Graphical Peak Discharge method

Given Input Data:

Description	Predeveloped Drainage
Rainfall distribution	Type II
Frequency	25 year
Rainfall, P (24-hours)	2.2000 in
Drainage area	3.0700 mi2
Runoff curve number, CN	67
Time of concentration, Tc	0.4678 hrs
Pond and Swamp Areas	0.0000 % of Area

Computed Results:

Initial abstraction, Ia	0.9851 in
Ia/P	0.4478
Unit peak discharge, qu	303.2220 csm/in
Runoff, Q	0.2404 in
Pond and swamp adjustment, Fp	1.0000
Peak discharge, qp	223.7736 cfs

The peak discharge of 223.8 cfs was calculated for predeveloped conditions.

DEVELOPED DRAINAGE ANALYSIS

TIME OF CONCENTRATION
DEVELOPED DRAINAGE ANALYSIS

Sheet Flow

Description .... Developed Drainage
Manning's n 0.1300
Flow Length ....300.0000 ft
Two Yr, 24 hr Rainfall .... 1.100 in
Land Slope.. 0.2000 ft/ft
Computed Sheet flow time...............................> 0.2381 hrs

Shallow Concentrated Flow

Description .... Developed Drainage
Surface...Unpaved
Flow Length ....1000.0000 ft
Watercourse Slope... 0.500 ft/ft
Velocity .... 11.4088 fps
Computed Shallow flow time............................> 0.0243 hrs

Channel Flow

Description .... Developed Drainage
Flow Area...8.0000 ft2
Wetted Perimeter..96.0000 in
Flow Length ....19402.0000 ft
Channel Slope .... 0.0760 ft/ft
Manning's n... 0.0200
Hydraulic Radius...12.0000 in
Velocity .... 20.4831 fps
Computed Channel flow time ....> 0.2631 hrs

Total Time of Concentration .... > 0.5255 hrs

****

PEAK DISCHARGE
DEVELOPED DRAINAGE ANALYSIS

SCS TR-55 Graphical Peak Discharge method

Given Input Data:

Description	Developed Drainage
Rainfall distribution	Type II
Frequency	25 year
Rainfall, P (24-hours)	2.2000 in
Drainage area	3.0700 mi2
Runoff curve number, CN	67
Time of concentration, Tc	0.5255 hrs
Pond and Swamp Areas	0.0000 % of Area

Computed Results:

Initial abstraction, Ia	0.9851 in
Ia/P	0.4478
Unit peak discharge, qu	284.2146 csm/in
Runoff, Q	0.2404 in
Pond and swamp adjustment, Fp	1.0000
Peak discharge, qp	209.7464 cfs

The peak discharge of 209.7 cfs was calculated for developed conditions, which is less than peak discharge in predeveloped condition.

APPENDIX K
LIFE EXPECTANCY CALCULATIONS

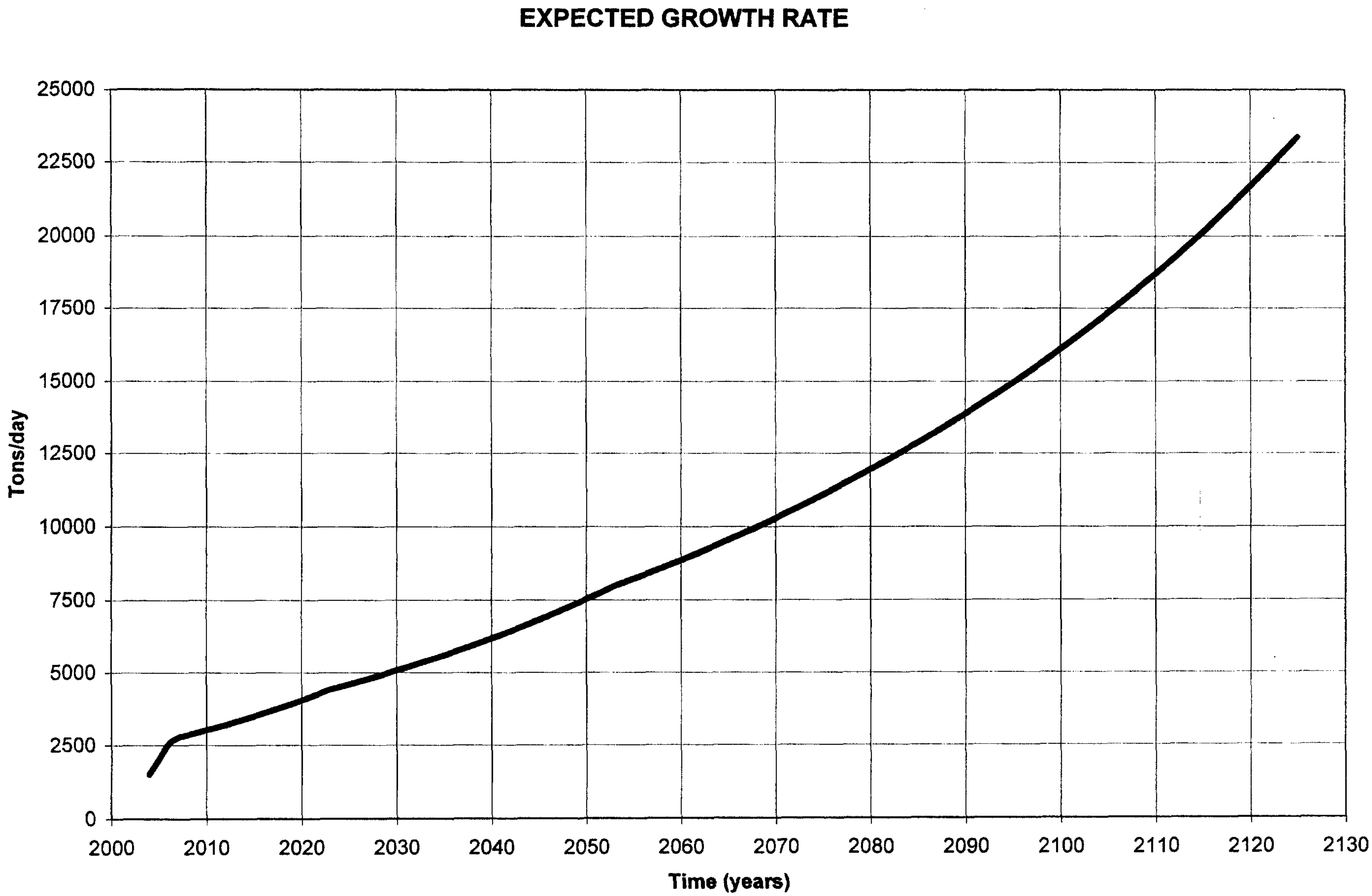
Anticipated Life Span of Class I Landfill

Year	Tons/day	Tons/year	Accum Tons
2004	1500	450000	4.50E+05
2005	2000	600000	1.05E+06
2006	2500	750000	1.80E+06
2007	2750	825000	2.63E+06
2008	2833	849750	3.47E+06
2009	2917	875242.5	4.35E+06
2010	3005	901499.8	5.25E+06
2011	3095	928544.8	6.18E+06
2012	3188	956401.1	7.14E+06
2013	3284	985093.1	8.12E+06
2014	3382	1014646	9.14E+06
2015	3484	1045085	1.02E+07
2016	3588	1076438	1.13E+07
2017	3696	1108731	1.24E+07
2018	3807	1141993	1.35E+07
2019	3921	1176253	1.47E+07
2020	4038	1211540	1.59E+07
2021	4160	1247887	1.71E+07
2022	4284	1285323	1.84E+07
2023	4413	1323883	1.98E+07
2024	4501	1350360	2.11E+07
2025	4591	1377368	2.25E+07
2026	4683	1404915	2.39E+07
2027	4777	1433013	2.53E+07
2028	4872	1461674	2.68E+07
2029	4970	1490907	2.83E+07
2030	5069	1520725	2.98E+07
2031	5170	1551140	3.13E+07
2032	5274	1582163	3.29E+07
2033	5379	1613806	3.45E+07
2034	5487	1646082	3.62E+07
2035	5597	1679004	3.79E+07
2036	5709	1712584	3.96E+07
2037	5823	1746835	4.13E+07
2038	5939	1781772	4.31E+07
2039	6058	1817407	4.49E+07
2040	6179	1853756	4.68E+07
2041	6303	1890831	4.87E+07
2042	6429	1928647	5.06E+07
2043	6557	1967220	5.26E+07
2044	6689	2006565	5.46E+07
2045	6822	2046696	5.66E+07
2046	6959	2087630	5.87E+07
2047	7098	2129382	6.08E+07
2048	7240	2171970	6.30E+07
2049	7385	2215409	6.52E+07
2050	7532	2259718	6.75E+07
2051	7683	2304912	6.98E+07
2052	7837	2351010	7.21E+07
2053	7993	2398030	7.45E+07
2054	8113	2434001	7.70E+07
2055	8235	2470511	7.94E+07
2056	8359	2507569	8.19E+07
2057	8484	2545182	8.45E+07
2058	8611	2583360	8.71E+07
2059	8740	2622110	8.97E+07

ASSUMPTIONS USED IN CALCULATIONS
1000 usable acres for Class I disposal
Unit weight of MSW is 1200 lb/yd3
1500 tons/day for the first year of operation
2000 tons/day for the second year of operation
2500 tons/day for the third year of operation
2750 tons/day for the fourth year of operation
3% annual growth rate after the fourth year of operation
2% annual growth rate after the twentieth year of operation
1.5% annual growth rate after the fiftieth year of operation
10% reduction for intermediate cover

Volume (yd3)	642,124,250
SW of MSW (lb/yd3)	1,200
Waste (lb)	770,549,100,000
Waste (tons)	385,274,550
Landuse Factor	0.9
Total Waste (tons)	346,747,095
Years	121

2060	8871	2661442	9.24E+07
2061	9005	2701364	9.51E+07
2062	9140	2741884	9.78E+07
2063	9277	2783012	1.01E+08
2064	9416	2824757	1.03E+08
2065	9557	2867129	1.06E+08
2066	9700	2910136	1.09E+08
2067	9846	2953788	1.12E+08
2068	9994	2998095	1.15E+08
2069	10144	3043066	1.18E+08
2070	10296	3088712	1.21E+08
2071	10450	3135043	1.24E+08
2072	10607	3182068	1.28E+08
2073	10766	3229799	1.31E+08
2074	10927	3278246	1.34E+08
2075	11091	3327420	1.37E+08
2076	11258	3377331	1.41E+08
2077	11427	3427991	1.44E+08
2078	11598	3479411	1.48E+08
2079	11772	3531602	1.51E+08
2080	11949	3584576	1.55E+08
2081	12128	3638345	1.58E+08
2082	12310	3692920	1.62E+08
2083	12494	3748314	1.66E+08
2084	12682	3804539	1.70E+08
2085	12872	3861607	1.74E+08
2086	13065	3919531	1.77E+08
2087	13261	3978324	1.81E+08
2088	13460	4037999	1.86E+08
2089	13662	4098569	1.90E+08
2090	13867	4160047	1.94E+08
2091	14075	4222448	1.98E+08
2092	14286	4285785	2.02E+08
2093	14500	4350071	2.07E+08
2094	14718	4415322	2.11E+08
2095	14939	4481552	2.16E+08
2096	15163	4548776	2.20E+08
2097	15390	4617007	2.25E+08
2098	15621	4686262	2.29E+08
2099	15855	4756556	2.34E+08
2100	16093	4827905	2.39E+08
2101	16334	4900323	2.44E+08
2102	16579	4973828	2.49E+08
2103	16828	5048435	2.54E+08
2104	17081	5124162	2.59E+08
2105	17337	5201024	2.64E+08
2106	17597	5279040	2.69E+08
2107	17861	5358225	2.75E+08
2108	18129	5438599	2.80E+08
2109	18401	5520178	2.86E+08
2110	18677	5602980	2.91E+08
2111	18957	5687025	2.97E+08
2112	19241	5772331	3.03E+08
2113	19530	5858915	3.09E+08
2114	19823	5946799	3.15E+08
2115	20120	6036001	3.21E+08
2116	20422	6126541	3.27E+08
2117	20728	6218439	3.33E+08
2118	21039	6311716	3.39E+08
2119	21355	6406392	3.46E+08
2120	21675	6502488	3.52E+08
2121	22000	6600025	3.59E+08
2122	22330	6699025	3.66E+08
2123	22665	6799511	3.72E+08
2124	23005	6901503	3.79E+08
2125	23350	7005026	3.86E+08


EXPECTED GROWTH RATE
Tons/day
25000
22500
20000
17500
15000
12500
10000
7500
5000
2500
0
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
2110
2120
2130
Time (years)

APPENDIX L
FUGITIVE WASTE PLAN

APPENDIX L

FUGITIVE WASTE PLAN

Introduction

Promontory Landfill LLC is committed to use management, engineering, process, and personnel controls to aggressively limit the occurrence of fugitive waste.

Description of potential fugitive waste generators and prevention and control steps.

Waste loads entering the landfill must be covered. Promontory Landfill LLC will purchase containers that are equipped with covers. In the unlikely event of receiving an uncovered load, it will be stopped for corrective actions. First time violators will receive a one-time warning. Repeat violators will be subject to increased disposal fees.

Upon entering the site, waste loads will be taken to an enclosed transfer station. The transfer station will specifically be designed with prevention of fugitive waste in mind. The transfer of waste from incoming containers either by truck or rail will be contained within the transfer station. Incoming containers would be removed and loaded to onsite haul trucks for transit and unloading at the working face. Empty containers will be cleaned either at the working face, inside the transfer building, or in a fenced compound before being placed back into service. Waste inside the transfer station will be picked up daily with though cleaning conducted weekly.

The buffer area around the disposal area will be given special attention, as it is the final opportunity to prevent fugitive waste from leaving the site. A five-foot high berm would be built and topped with a 15-foot high fence. The fence and berm combination would begin on the hill along the east side, wrap around the south side of the property and then run along the west side to a point where the property begins to gain significant elevation. The remainder of the property would be fenced with a 6-foot high fence. Fencing would be inspected weekly and waste cleanup and repair of the fence would occur as necessary. Cleanup of the site would occur at least monthly and after high wind events to minimize the amount of waste reaching the fence. The drivers of the haul trucks will inspect haul roads and spills will be cleaned up as reported. Spills inside the site would be cleaned up as detected. Any waste that escapes the site would be collected and disposed of before the end of the next working day.

At the working face, fugitive waste will be minimized in multiple ways. First the working face will be reduced to the smallest workable area as possible. It is anticipated the working face will be about a half acre. Next temporary 12' high fencing will be placed around the working face to keep fugitive waste from moving out onto the site. Other temporary fencing will be erected if necessary to contain waste on site.

APPENDIX M
MONITORING PLAN

AQUA ENGINEERING, INC.

APPENDIX M
MONITORING PLAN

The purpose of this monitoring schedule is to help prevent problems that may be preventable through identification and prompt remediation efforts. A sample schedule for monitoring and inspection of the landfill facilities to ensure proper operation and maintenance is provided in the Appendix O. Listed below are monitoring guidelines for groundwater monitoring, leachate monitoring and control system, and landfill gas monitoring system.

1. Groundwater Monitoring System

Background concentrations of the constituents for detection monitoring will be obtained through eight independent samples from the upgradient and four independent samples from each of the down gradient wells. After background concentrations have be determined, groundwater monitoring would be conducted semi-annually in the spring and fall from the up-gradient and down-gradient wells. The well locations and a typical well design are shown in the attached Figure I-1, I-2, I-3, and I-4. Groundwater samples would be analyzed for detection of constituents per the Utah State Administrative Code R315-308 Ground Water Monitoring Requirements. The list of constituents provided below are current as of June 2003 for detection monitoring. The Landfill Operator shall be responsible for insuring compliance with current regulations for detection monitoring.

CONSTITUENTS FOR DETECTION MONITORING				
		Groundwater Protection Standard	Detection Limits	
			EPA 6020	Cold Vapor AAS
Inorganic Constituents	CAS	(mg/l)	(mg/l)	(mg/l)
Ammonia (as N)	7664-41-7			
Carbonate/Bicarbonate				
Calcium				

Chemical Oxygen Demand (COD)				
Chloride				
Iron	7439-89-6			
Magnesium				
Manganese	7439-96-5			
Nitrate (as N)				
pH				
Potassium				
Sodium				
Sulfate				
Total Dissolved Solids (TDS)				
Total Organic Carbon (TOC)				
Heavy Metals				
Antimony	7440-36-0	0.006	0.003	
Arsenic	7440-38-2	0.05	0.005	
Barium	7440-39-3	2	0.005	
Beryllium	7440-41-7	0.004	0.001	
Cadmium	7440-43-9	0.005	0.001	
Chromium		0.1	0.005	
Cobalt	7440-48-4	2	0.03	
Copper	7440-50-8	1.3	0.012	
Lead		0.015	0.003	
Mercury	7439-97-6	0.002		0.0002
Nickel	7440-02-0	0.1	0.01	
Selenium	7782-49-2	0.05	0.001	
Silver	7440-22-4	0.1	0.002	
Thallium		0.002	0.001	

Vanadium	7440-62-2	0.3	0.03	
Zinc	7440-66-6	5	0.03	
Organic Constituents				
Acetone	67-64-1	4	0.005	0.005
Acrylonitrile	107-13-1	0.1	0.01	0.05
Benzene	71-43-2	0.005	0.0005	0.001
Bromochloromethane	74-97-5	0.01	0.0005	0.001
Bromodichloromethane[1]	75-27-4	0.1	0.0005	0.001
Bromoform[1]	75-25-2	0.1	0.0005	0.001
Carbon disulfide	75-15-0	4	0.0005	0.001
Carbon tetrachloride	56-23-5	0.005	0.0005	0.001
Chlorobenzene	108-90-7	0.1	0.0005	0.001
Chloroethane	75-00-3	15	0.0005	0.001
Chloroform[1]	67-66-3	0.1	0.0005	0.001
Dibromochloromethane[1]	124-48-1	0.1	0.0005	0.001
1,2-Dibromo-3-chloropropane	96-12-8	0.0002	0.000005	0.00001
1,2-Dibromoethane	106-93-4	0.00005	0.000005	0.00001
1,2-Dichlorobenzene (ortho)	95-50-1	0.6	0.0005	0.001
1,4-Dichlorobenzene (para)	106-46-7	0.075	0.0005	0.001
trans-1,4-Dichloro-2-butene	110-57-6		0.01	0.02
1,1-Dichloroethane	75-34-3	4	0.0005	0.001
1,2-Dichloroethane	107-06-2	0.005	0.0005	0.001
1,1-Dichloroethylene	75-35-4	0.007	0.0005	0.001
cis-1,2-Dichloroethylene	156-59-2	0.07	0.0005	0.001
trans-1,2-Dichloroethylene	156-60-5	0.1	0.0005	0.001
1,2-Dichloropropane	78-87-5	0.005	0.0005	0.001
cis-1,3-Dichloropropene	10061-01-5	0.002	0.0005	0.001
trans-1,3-Dichloropropene	10061-02-6	0.002	0.0005	0.001
Ethylbenzene	100-41-4	0.7	0.0005	0.001

2-Hexanone	591-78-6	1.5	0.005	0.01
Methyl bromide	74-83-9	0.01	0.0005	0.001
Methyl chloride	74-87-3	0.003	0.0005	0.001
Methylene bromide	74-95-3	0.4	0.0005	0.001
Methylene chloride	75-09-2	0.005	0.001	0.005
Methyl ethyl ketone	78-93-3	0.17	0.005	0.01
Methyl iodide	74-88-4		0.001	0.01
4-Methyl-2-pentanone	108-10-1	3	0.005	0.01
Styrene	100-42-5	0.1	0.0005	0.001
1,1,1,2-Tetrachloroethane	630-20-6	0.07	0.0005	0.001
1,1,2,2-Tetrachloroethane	79-34-5	0.005	0.0005	0.001
Tetrachloroethylene	127-18-4	0.005	0.0005	0.001
Toluene	108-88-3	1	0.0005	0.001
1,1,1-Trichloroethane	71-55-6	0.2	0.0005	0.001
1,1,2-Trichloroethane	79-00-5	0.005	0.0005	0.001
Trichloroethylene	79-01-6	0.005	0.0005	0.001
Trichlorofluoromethane	75-69-4	10	0.0005	0.001
1,2,3-Trichloropropane	96-18-4	0.04	0.0005	0.001
Vinyl acetate	108-05-4	37	0.005	0.01
Vinyl Chloride	75-01-4	0.002	0.0005	0.005
Xylenes	1330-20-7	10	0.0005	0.001

[1] The ground water protection standard of 0.1 mg/l is for the total of Bromodichloromethane, Bromoform, Chloroform, and Dibromochloromethane.

The water samples would be collected using currently accepted and approved techniques and technologies. The protocols for sampling would consist of water level measurements, detection of immiscible layers, well purging, field measurements, sample collection, sample handling and preservation, and sample custody. Samples would be tested using a state certified laboratory. Each sampling protocol is discussed in detail below.

- Water level measurements would be read to the nearest 0.01 foot. If a probe were to be used for measurement, it would be cleaned between each reading and calibrated according to Manufacturer's recommendations. Elevations at each well would be known for cross-references and determination of ground water levels in the area. Measurements would be taken from the same location at each well.

- Detection of immiscible layers would begin with screening organic vapors with a monitor prior to any evacuation of water. If concentrations were to exceed 25 percent of the lower explosive limit, Promontory Landfill Facility personnel would immediately contact the Landfill Manager. If concentrations were below 25 percent of the lower explosive limit, an interface probe would be lowered into the well to detect and measure the thickness of any possible immiscible layer that may develop. The probe would further be lowered to the bottom of the well to register the presence of any dense organic liquids. If any immiscible layers were found, samples would carefully be retrieved.

- Each well would be equipped with a dedicated low flow pump designed to be non-aerating or non-leaching. In preparation for taking water samples, each monitoring well would be micro-purged to obtain a fresh sample. Micro-purging of a well would be performed by excavating water out of the well using the low flow pump. When purging a well, purging would continue until the pH, conductivity, and water temperature has stabilized or until at least three well volumes of water would be purged from the well. Stabilization would occur when pH, conductivity, and water temperature readings do not exceed 3 percent deviation. If the well purged dry, an exception may be taken and the well would be allowed to recover to 85% of initial water level or for a two-hour period, whichever occurred first.

- Field measurement samples would be collected in a clean beaker once the well was properly purged. All probes or instruments would be kept in designated containers to prevent cross contamination between samples. All instruments would be cleaned according to manufacture's recommendations after and prior to taking any measurements. Field measurements and field notes would include:

1. name of collector
2. time of sample
3. weather conditions
4. air temperature
5. date of sample
6. monitoring well identification number
7. lower explosive limit
8. immiscible layers found with thickness information
9. water temperature
10. turbidity
11. electrical conductivity
12. static water level
13. pH
14. dissolved oxygen
15. well yield
16. sampling procedures and methods
17. sampling identification number
18. preservatives used
19. containers used
20. parameters requested
21. daily instrument drift
22. and general comments section.

All of this information would be kept in a field notebook. All measurement instruments would be calibrated at the beginning of the day and rechecked after all the sampling was complete to record any possible instrument drift.

- The pumping rate shall not exceed 100 millimeter/minute. The degree of sensitivity to pH or volatilization would determine the order in which parameters are sampled. Sampling containers and procedures for preparations of samples would be provided by the testing laboratory.

- Once the samples were collected and prepared to laboratories recommendations, the sample would be immediately labeled, recorded in the field book, and placed in a sampling cooler. The samples would be recorded on a chain-of-custody and remain with the sampler until formally released to another individual.

- Custody of the samples would be documented on a chain of custody form. Samples would remain in the custody of the sampler until samples are checked in and relinquished to the laboratory or until they were relinquished for transport to the laboratory.

All data received would be reviewed to assess data validity. Each data report would be checked to insure the following:

- Identification numbers of the samples match.

- Chain of custody and field notes matches the sample information.

- Sample analysis was performed using requested methods and acceptable time limits.

- Reporting limits conform to current detection limits.

- Blank results have been included and are acceptable.

- MS/MSD results are representative and are included.

- All QA/QC sampling results are included and acceptable.

If there were any potential problems with the data reports or discrepancies, the laboratory would be notified immediately. If necessary, new samples would be collected and tested. Data would be analyzed by:

- Concentrations of naturally occurring constituents would be plotted at each well on control charts for that specific well. Each constituent would be analyzed to determine whether groundwater is being impacted.

- Look for the presence of non-naturally occurring compounds. If these compounds were reported, the validity of the results would be reviewed. If results appear to be potentially valid, new samples would be collected and tested.

Semi-annual reports would be prepared and would include the following in an electronic format:

- Description of procedures, including the quality assurance /quality control, followed during the collection of samples.

- Results of field measured parameters.

- Chain of custody and quality assurance /quality control procedures followed by the laboratory.

- Laboratory results with detection limits and testing methods used.

- Statistical analysis of the laboratory results.

After background constituent and levels have been established, the Owner would determine what statistical method would be used to determine whether a significant change has occurred compared to the background water quality.

2. Leachate Monitoring and Control System

The proposed Class I Landfill would be equipped with a leachate monitoring and control system. The system is comprised of a network of piping providing gravity flow to centrally located sumps positioned at the lowest elevation of the cell. The sumps would be activated if more than one foot of standing leachate is detected above the liner. The leachate would be pumped at a low flow rate to an evaporation basin or sprayed back on the surface of the landfill to suppress fugitive dust. Evaporation basins would accommodate peak flows. If the evaporation basins were unable to meet the demand generated by the leachate collection system, additional evaporation basins would be constructed.

3. Landfill Gas Monitoring System

Rule R315-303 Landfilling Standards require landfill gases to be monitored to protect air quality and limit explosive gas emissions. A hand-held field explosive gas meter would be used for recording at the site. The meter would be calibrated as recommended by the manufacture by using a methane standard. Concentrations would not be allowed to exceed 25% of the lower limit in facility structures and 100% of the lower limit around the disposal area boundary. Quarterly monitoring would be preformed at the locations indicated on Figure 4.5 and within all facility structures. Readings would be taken at the ground level. If a monitoring event were to exceed the regulatory limit, procedures would be taken as noted in Section 5.2

Explosive Gas Release. The Owner would install permanent gas detectors in facility structures. The Owner would be committed to remedy any problems.

APPENDIX N
EMERGENCY OPERATIONS PLAN

APPENDIX N

EMERGENCY OPERATIONS PLAN

This document provides landfill employees with information on how to respond and what to expect in the case of a major disaster, such as an earthquake. The Promontory Landfill Facility (hereafter referred to as the Facility), in an effort to respond to various disasters that could seriously threaten lives and property, has developed this Emergency Operations Plan. This Plan in not meant as a stand-alone plan; the intent is to use this plan in conjunction with State, County, and Local Emergency Operations Plans. The Department of Environmental Quality may elect to waive requirements for daily cover on construction and demolition materials during an emergency.

ASSUMPTIONS

1. The Facility is expected to continue normal operation and must maintain normal daily operation besides handling the disposal of emergency, nonhazardous rubble material. Because of the location of the Facility and the types of structures located on the premises, the Facility is expected to be minimally affected by most major disasters.

2. The Facility will be most heavily impacted approximately 72-hours after an emergency, when the clean up, removal and disposal of rubble begins. The Facility may then need to be open around the clock (24-hour operation). All of the Facility personnel and equipment will be needed to run the operation.

3. The primary responsibility of Landfill resources would be the Rail Transfer Area/Landfill operations.

FIRST RESPONSE

DURING WORKING HOURS

1. Remain calm and reassure others. Avoid objects that could fall. Do not touch downed power lines or objects touching downed power lines. This is especially significant at the Landfill.

2. Report your location, physical condition, and area damage to your supervisor.

3. Provided the Facility areas are not severely damaged or inaccessible, continue with normal duties. In the event that certain areas are severely damaged, perform other duties as assigned by the Supervisor.

4. The Supervisor should check all areas for structure damage and also check on site utilities. If necessary, turn these utilities off. Call the Weber and Box Elder County dispatch at (801) 399-8411 and (435) 734-3800 to report findings.

5. All efforts will be made to contact Facility employees' families and others that employees have listed on the Family Notification List. Employees will be notified of family status as soon as possible.

AFTER WORKING HOURS

1. Contact the Facility and give your location, status, and availability. If you are unable to get to the Landfill notify the supervisor.

2. The first person to arrive at the Landfill should check all structures for damage and check utilities (power, sewer, gas and water) lines. If necessary, turn these off.

3. After all structures and utilities have been inspected, perform normal duties unless otherwise assigned by the Supervisor.

4. The Supervisor should check all areas for structure damage and also check on site utilities. If necessary, turn these utilities off. Call the Weber and Box Elder County dispatch at (801) 399-8411 and (435) 734-3800 to report findings.

FACILITY OPERATIONS

1. The Landfill will maintain regularly scheduled working hours.

2. When the emergency cleanup begins, approximately 72-hours later, the Facility may need to be open 24-hours per day.

3. When 24-hour operation begins, all Facility personnel and equipment will be needed to run the Rail Transfer Area and Landfill operations.

4. During the clean up and disposal of rubble, City/County and State Health Department inspectors will need to be at the clean-up site to determine if the substance being disposed of contains hazardous material. If so determined, then the governing authorities (federal, state or local) must arrange for proper disposal at a designated hazardous waste disposal facility (not the Promontory Landfill Facility).

5. During 24-hour operation employees should expect to work 12-hour shifts. Management will decide which employees take the first shift and which employees take the second shift according to employee availability.

APPENDIX O
SAMPLE FORMS

RANDOM INSPECTION FORM

Date:_______________ Time:______________

Inspected by:____________________

Load Origin:_____________________

How was the inspection conducted?

____
____
____
____
____

What was found during inspection?

____
____
____
____
____
____
____
____

Is corrective action necessary? If so what?

____
____
____
____
____
____

Landfill Gas Quarterly Monitoring Results
Promontory Landfill LLC
Year______ Quarter______

Date: ____________________ Time:__________________

Name of Gas Sample Collector ____

Temperature ______________ Weather ________________

Monitoring device should be calibrated prior to initiating sampling.

Accomplished? Yes___ No___

Methane Monitoring Location	**Measured % LEL**	**Regulatory Action Limit (% LEL)**
1. Administrative Building		25
2. SW Corner of Rotary Dump		25
3. SW Corner of Bottom Dump Area		25
4. SE Corner of Intermodal Area		25
5. NW Corner of the Scale House		25
6. North Boundary		100
7. South Boundary		100

- Gas Sample Collector: If measured % LEL equals or exceeds internal action limit, contact the facility manager.
- Facility Manager: If measured %LEL equals or exceeds regulatory action limit, notify the State Director in compliance with 40 CFR 258.23(c).

Comments:

____

____

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____

____

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QUARTERLY INPECTION LOG
Promontory Landfill LLC

Area of Inspection	Needs Repair	Date of Repair	Comments
Off-loading Area			
Scale House			
Run-on/Run-off			
Roads			
Harborage			
Leachate Collection			
Gas Collection			
Perimeter Fencing and Access Gates			
Fugitive Waste collection System			
Fugitive Waste			
Cell			
Date:	Inspector:		

Note: Annual Report due before March 1.